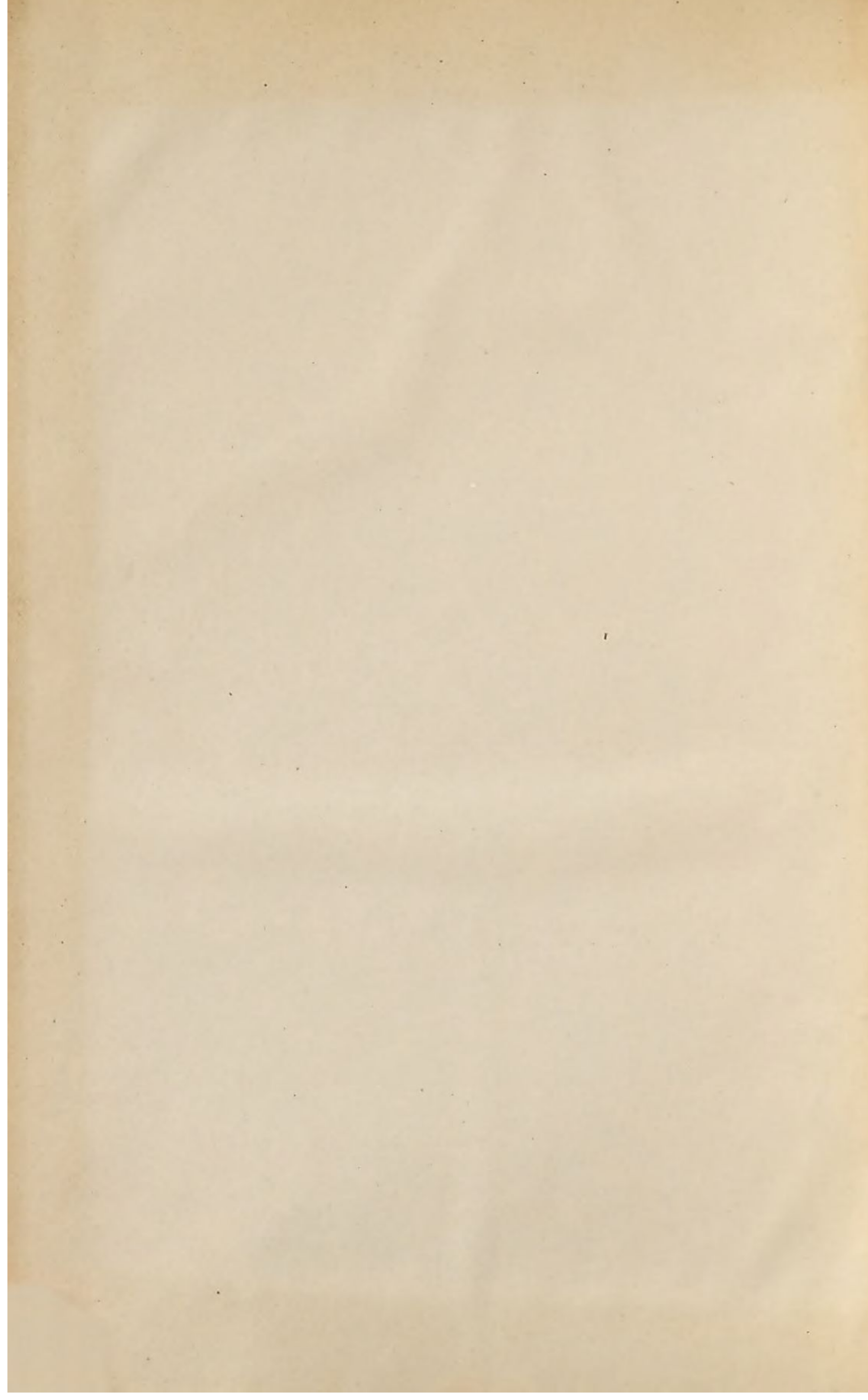


Am. B.

Proceedings

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THE
MISCELLANEOUS DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

SECOND SESSION OF THE FIFTY-THIRD CONGRESS.

1893-'94.

IN FORTY VOLUMES.

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INDEX TO MISCELLANEOUS DOCUMENTS OF THE HOUSE OF REPRESENTATIVES.

Fifty-third Congress, Second Session.

CONTENTS OF THE VOLUMES.

- Vol. 1.—Nos. 1 to 207, inclusive, except Nos. 29, 38; 47, 54, 55, 81, 82, 93, *96, 97, 107, 119, 120, 121, 122, 123, 130, 173, 175, 176, 177, 178, 179, 180, 181, 184, 200, and 205.
- Vol. 2.—No. 29, pt. 1: Official Register of the United States, vol. 1.
- Vol. 3.—No. 29, pt. 2: “ “ “ “ “ “ vol. 2.
- Vol. 4.—No. 38: Mineral Resources of the United States, 1892.
- Vol. 5.—No. 47: Monographs of the United States Geological Survey, vol. 22.
- Vol. 6.—No. 54: Consular Reports, vol. 43.
- Vol. 7.—No. 55, pt. 1: Official Records of the War of the Rebellion, vol. 43, pt. 1.
- Vol. 8.—No. 55, pt. 2: “ “ “ “ “ “ vol. 43, pt. 2.
- Vol. 9.—No. 81: Eleventh Annual Report of the Bureau of Ethnology.
- Vol. 10.—No. 82: Twelfth “ “ “ “ “ “
- Vol. 11.—Nos. 93, 214, 215, and 216.
- Vol. 12.—No. 97: Official Records of the War of the Rebellion, vol. 44.
- Vol. 13.—No. 107: Fifth International Geological Congress.
- Vol. 14.—No. 119: Monographs of the United States Geological Survey, vol. 23.
- Vol. 15.—No. 120: “ “ “ “ “ “ vol. 24.
- Vol. 16.—No. 121, pt. 1: Official Records of the War of the Rebellion, vol. 45, pt. 1.
- Vol. 17.—No. 121, pt. 2: “ “ “ “ “ “ vol. 45, pt. 2.
- Vol. 18.—No. 122: Bulletin of the United States Fish Commission, 1892.
- Vol. 19.—No. 123: Consular Reports, vol. 44.
- Vol. 20.—No. 130: Bulletin of the United States Fish Commission, 1893.
- Vol. 21.—No. 173: Contributions to North American Ethnology, vol. 9.
- Vol. 22.—No. 175: Special Consular Reports, vol. 10.
- Vol. 23.—No. 176: Bulletins of the United States Geological Survey, Nos. 87 to 89.
- Vol. 24.—No. 177: “ “ “ “ “ “ Nos. 90 to 97.
- Vol. 25.—No. 178: “ “ “ “ “ “ Nos. 98 to 101.
- Vol. 26.—No. 179: “ “ “ “ “ “ Nos. 102 to 106.
- Vol. 27.—No. 180: “ “ “ “ “ “ Nos. 107 to 117.
- Vol. 28.—No. 181: Mineral Resources of the United States, 1893.
- Vol. 29.—No. 184, pt. 1: Report of the Smithsonian Institution, 1893, part 1.
- Vol. 30.—No. 184, pt. 2: “ “ “ “ “ “ part 2.
- Vol. 31.—No. 200: Report of the Weather Bureau, 1893.
- Vol. 32.—No. 205: Consular Reports, vol. 45.
- Vol. 33.—No. 208, pt. 1: Official Records of the War of the Rebellion, vol. 46, pt. 1.
- Vol. 34.—No. 208, pt. 2: “ “ “ “ “ “ vol. 46, pt. 2.
- Vol. 35.—No. 208, pt. 3: “ “ “ “ “ “ vol. 46, pt. 3.
- Vol. 36.—No. 209: Report of the Commissioner of Fish and Fisheries, 1892.
- Vol. 37.—No. 210: Compilation of Messages of the Presidents of the United States.
- Vol. 38.—No. 211: Celebration of the laying of the Corner Stone of the Capitol.
- Vol. 39.—No. 212: History and Digest of International Arbitrations.
- Vol. 40.—No. 213: List of Private Claims, Forty-seventh to Fifty-first Congress.

*NOTE.—Mis. Doc. No. 96 bound in volume 25, House Ex. Documents.

INDEX TO HOUSE MISCELLANEOUS DOCUMENTS.

Subject.	No.	Vol.
A.		
Adams, O. F	146	1
Allen, Andrew	10	1
Anderson, John	125	1
Apache Reservation, relative to leases of certain lands in	87	1
Appropriation, relative to repeal of certain permanent specific and indefinite	86	1
Arbitrations, history and digest of international		39
Arnold, J	102	1
Atlanta (Ga.) St. Philip's Church	203	1
Austin, Simeon, resolution to refer to Court of Claims	141	1
Austin, C	66	1
B.		
Bailey, Benj. P	37	1
Bailey, Wiley	56	1
Baker, C. C	11	1
Barker, T. G	164	1
Bateman, John	94	1
Battle, M. H	186	1
Baudry, Omer	129	1
Beck, Joshua	208	1
Bell, Clara (steamer)	144	1
Bell, Josiah L	146	1
Benham, Rear-Admiral	90	1
Bishop, W. J	27	1
Black, George	172	1
Blackman, Alfred	62	1
Blick, A. T	33	1
Bonds of United States, relative to authority for issue and sale of	73	1
Books, pamphlets, etc., list of, in folding room	20	1
Brayboy, Tenor	27	1
Bray, John	128	1
Broadfoot, C. W	9	1
Brooke, J. C	41	1
Brooks, O. C	159	1
Brown, Septimus	192	1
Burguyn, J. A	84	1
Bureau of Ethnology. (See Ethnology.)		
Bureau of Statistics, report on imported merchandise	96	(*)
Butler, H. A	172	1
C.		
Caldwell, Robert	157	1
California, resolution relative to examination of certain river and harbor improvements on coast of	207	1
Campbell, John	132	1
Campbell, Thomas W	25	1
Canada, for information relative to amount of merchandise in bond transported through	92	1
Capitol, celebration of laying corner stone of		38
Carb, David and Barbette	129	1

* Bound with vol. 25, House Executive Documents.

Subject.	No.	Vol.
Carpenter, S. L	186	1
Carter, George W	39	1
Case, George	114	1
Causey, J. W	74	1
Census, abstract of population of Eleventh	185	1
Champion, Margaret	190	1
Chasteen, William	59	1
Chipman, J. Logan, eulogies on	214	11
Claims, index to private, from Forty-seventh to Fifty-first Congress		40
<i>Clara Bell</i> (steamer)	144	1
Clark, Stephen D	187	1
Clerk of House of Representatives. (See House of Representatives.)		
Coday, sr., Samuel	57	1
Coffman, Samuel	127	1
Columbia Suburban Railroad Company	65	1
Comer, A. F	9	1
Commissioner of Fish and Fisheries, report of, for 1892		36
Commissioner of Labor, report of, on expenditures in Department of Labor	22	1
Consular Reports:		
Volume 43		6
Volume 44		19
Volume 45		32
Special volume 10		22
Corinth (Miss.) Baptist and Cumberland Presbyterian churches	203	1
Copeland, J. D	156	1
Court of Claims, judgments rendered by:		
Allen, Andrew	10	1
Anderson, John	125	1
Arnold, J	102	1
Austin, C	66	1
Austin, Simeon	141	1
Bailey, Benj. P	37	1
Bailey, Wiley	56	1
Baker, C. C	11	1
Barker, T. G	164	1
Bateman, John	94	1
Beck, Joshua	204	1
Bishop, W. J	27	1
Black, George	172	1
Blackman, Alfred	62	1
Blick, H. T	33	1
Braboy, Tenor	27	1
Bray, John	128	1
Broadfoot, C. W	9	1
Brooke, J. C	41	1
Brooks, O. C	159	1
Burguyn, J. A	84	1
Butler, H. A	172	1
Caldwell, Robert	157	1
Campbell, John	132	1
Campbell, Thomas W	25	1
Carter, George W	39	1
Case, George	114	1
Cases dismissed for want of proof of loyalty	24	1
	167	1
Causey, J. W	74	1
Chasteen, William	59	1
Coday, sr., Samuel	57	1
Coffman, Samuel	127	1
Comer, A. F	9	1
Copeland, J. D	156	1
Coxen, Morgan	18	1

Subject.	No.	Vol.
Court of Claims, judgments rendered by:		
Creser, Jacob	149	1
Crowell, Charles	99	1
Davis, Phil	31	1
Davis, T. O	27	1
Davis, T. W	36	1
Dellinger, William	136	1
Drumwright, A. J	168	1
Dunn, Mary J	158	1
Dwyer, P	9	1
Eason, S. S	62	1
Ebbs, William	91	1
Engle, E. C	136	1
Engle, J. M	134	1
Evans, James E	95	1
Ferguson, Jno	27	1
Ferrell, J. R	34	1
Fitzhugh, Henry	63	1
Gaddy, F. M. and H. A	115	1
Garrison, Margaret	59	1
Giebelhouse, Philip	83	1
Gilbert, E. S	10	1
Golden, S. M	32	1
Graham, A	115	1
Green, Eliza	49	1
Griffith, G. W	199	1
Grim, Jacob	128	1
Grison, W. C	31	1
Grove, E. S	15	1
Haitz, Robert	101	1
Hale, E. M	154	1
Harper, G. C	116	1
Hartman, John	74	1
Haughton, Jeffrey	163	1
Hays, J. N	13	1
Hays, J. S	61	1
Henderson, Wm	10	1
Hensell, M. E	150	1
Herd, Samuel	161	1
Hicks, John T	106	1
Higgins, John	61	1
Hill, James W	48	1
Holmes, C	102	1
Hoodenpyle, Robert	74	1
Hough, Austin	110	1
James, J. K	115	1
James, William M	64	1
Johnson, Hiram	88	1
Johnston, A. P	166	1
Jones, Lucy A. M	171	1
Kennedy, A. H	12	1
Kilham, S	136	1
Kinman, Riley	163	1
Kioby, R. L	40	1
Knight, Michael	35	1
Knight, N. H	172	1
Kotz, Francis	17	1
Lee, M. M	12	1
Lemen, W. M	150	1
Luttrell, Green	138	1
McAdams, William	174	1
McCracken, John	70	1
McErr, Andrew	124	1
Maury, J. H	9	1

Subject.	No.	Vol.
Court of Claims, judgments rendered by:		
Merritt, J	111	1
Menillon, Alphonse	134	1
Miller, John	16	1
Murphy, J. S	9	1
Neeley, W. W	45	1
Norris, B. T	194	1
Orme, Walter	104	1
Palmer, E. A	27	1
Patrick, J. M	53	1
Patton, Henry	71	1
Perkins, R. S	58	1
Phelan, J. G	52	1
Pierce, J. F	128	1
Piggott, Jesse	147	1
Powell, Mary	153	1
Powell, W. M	118	1
Rawlins, N	9	1
Reid, William	148	1
Rowlett, John W	183	1
Russell, Thomas W	50	1
Ryan, Thomas	67	1
Saxson, W. G	61	1
Show, George	134	1
Shumate, A. B. and William	155	1
Shumate, James H	108	1
Smith, John	151	1
Sneuffer, A. T	98	1
Speed, M. E	66	1
Stafford, John	61	1
Stewart, F. B	100	1
Stone, Malinda	51	1
Stonebaker, G. E	147	1
Talbott, R	102	1
Terry, T. O	155	1
Thompson, P. H	27	1
Tipton, M	9	1
Ubele, Christian	83	1
Vinton, M. C	112	1
Wallace, William	11	1
Waters, Robert	85	1
Williams, M. R	124	1
Womack, J. M	14	1
Wood, A. M	165	1
Woodard, W. H	30	1
Wood, D. T	182	1
Woods, B. A	131	1
Woods, S. P	115	1
Woolsey, Wm	135	1
Coxen, Morgan	18	1
Criser, Jacob	149	1
Crow, William	142	1
Crowell, Charles	99	1
Currier, E. L	21	1
D.		
Davis, Phil	31	1
Davis, T. O	27	1
Davis, T. W	36	1
Delap, Nelson, and others	193	1
Dellinger, W	136	1
Department of Labor, report on expenditures of	22	1
Disloyalty, cases dismissed by Court of Claims for	{ 24	1
	{ 167	1

Subject.	No.	Vol.
District of Columbia:		
Columbia Suburban Railroad Company	65	1
Excise board, report of	117	1
Gas, investigation of	109	1
Metropolitan Railroad Company	68	1
Streets and avenues, relative to repairs of certain	137	1
Washington and Georgetown Railroad Company	72	1
Doorkeeper. (<i>See House of Representatives.</i>)		
Drumwright, A. J.	168	1
Dunn, Mary J.	158	1
Dwyer, P.	9	1
E.		
Eason, S. S.	62	1
Ebbs, William	91	1
Eleventh Census, abstract relating to population	185	1
Elliott, John R.	129	1
Employés in Treasury Department from South Carolina	69	1
Engle, E. C.	136	1
Engle, J. M.	134	1
Enochs, William H., eulogies of	215	11
Ethnology, eleventh annual report of Bureau of		9
twelfth annual report of Bureau of		10
Contributions to North American (vol. 9)		21
Eulogies:		
Chipman	214	11
Enochs	215	11
Lilly	216	11
Mutchler	93	11
Evans, James E.	95	1
F.		
Ferguson, John	27	1
Ferrell, J. R.	34	1
Filhiol, Hypolite, <i>et al</i>	77	1
Fish and Fisheries, report of Commissioner of, 1892		36
letter of Commissioner relative to establishing hatchery at Philadelphia	198	1
report of Commissioner on damage to, in Wabash River	196	1
Fish Commission, bulletin of, for 1892		18
bulletin of, for 1893		20
Fitzhugh, Henry	63	1
Folding room. (<i>See House of Representatives.</i>)		
Foster, John	140	1
Fowle, James L.	146	1
Freedman's Savings and Trust Company, annual report of commissioner	26	1
G.		
Gaddy, F. M. and H. A.	115	1
Garrison, Margaret	59	1
Garrot, Pierre	129	1
Gas investigation in District of Columbia	109	1
Gelological Congress, report of the Fifth International		13
Geological Survey:		
Monographs of (vol. 22)		5
(vol. 23)		14
(vol. 24)		15
Bulletins 87 to 89		23
90 to 97		24
98 to 101		25
102 to 106		26
107 to 117		27

Subject.	No.	Vol.
Geological Survey:		
Report on mineral resources of United States for 1892	---	4
1893	---	28
Gibson, William F	80	1
Giebelhouse, Philip	83	1
Gilbert, E. S.	10	1
Gilfoil, Patrick	190	1
Golden, S. M.	32	1
Graham, A.	115	1
Grand Junction (Tenn.) Baptist Church	203	1
Griffith, G. W., report of Court of Claims on	199	1
Green, Eliza	49	1
Grim, Jacob	128	1
Gussin, W. C.	31	1
Grove, E. S.	15	1
H.		
Haitz, Robert	101	1
Hale, E. M.	154	1
Harper, G. C.	116	1
Hartman, John	74	1
Hawaii:		
Sense of House relative to	75	1
Relative to use of U. S. naval force at	60	1
Relative to intervention by U. S. Government in affairs of (friendly government):		
"Hitt"	42	1
"Boutelle"	43	1
"McCreary"	44	1
Hays, J. N.	13	1
Hays, J. S.	61	1
Helena (Ark.) First Baptist Church	201	1
Henderson, William	10	1
Hensell, M. E.	150	1
Herd, Samuel	161	1
Hicks, John T.	106	1
Higgins, John	61	1
Hill, James W.	48	1
Holmes, C.	102	1
Hoodenpyle, Robert	74	1
Hough, Austin, report of Court of Claims	110	1
Houghton, Jeffrey	163	1
House of Representatives:		
List of members and their place of residence	1	1
Standing committees of	2	1
Alphabetical list of Members and Delegates and the standing committees on which they serve	3	1
Books, pamphlets, etc., in folding room of	20	1
Members' pay, to enforce deductions for absence	126	1
Messengers for the minority	21	1
Property in charge of Doorkeeper	19	1
Clerk	6	1
Sergeant-at-Arms	4	1
Receipts and disbursements of Sergeant-at-Arms of	5	1
Report of waste-paper sales by Doorkeeper of	23	1
Ventilation of, to promote by employing night force	162	1
Hubbard, Mary Jane	133	1
Huntsville (Ala.) Primitive Baptist Church	203	1
I.		
Indian reservations, relative to renewal of leases on certain, in Okla- homa Territory	87	1
Imported merchandise, report on, for 1890-1893	96	(*)

* Bound in vol. 25, House Executive Documents.

Subject.	No.	Vol.
International arbitrations, history and digest of.....		39
International Geological Congress, report of proceedings of.....	107	13
J.		
James, J. K.....	115	1
James, William M.....	64	1
Jenison, George.....	21	1
Johnson, Hiram.....	88	1
Johnston, J. P.....	166	1
Jones, Isaac.....	186	1
Jones, Lucy A. M.....	171	1
K.		
Kennedy, A. H.....	12	1
Kilham, S.....	136	1
Kinman, Riley.....	163	1
Kiowa Reservation, relative to certain leases of lands in.....	87	1
Kirby, R. L.....	40	1
Knight, Joseph.....	129	1
Knight, Michael.....	35	1
Knight, N. H.....	172	1
Kotz, Francis.....	17	1
L.		
Labor troubles, to investigate (Pullman).....	189	1
Lee, M. M.....	12	1
Lemen, W. M.....	150	1
Lewis, Abner D.....	193	1
Library of Congress, report on construction of building for.....	7	1
Lilly, William, eulogies of.....	216	11
Lobdel, Charles S.....	191	1
Lovelace, Emma C.....	187	1
Luttrell, Green.....	138	1
M.		
McAdams, William.....	174	1
McCracken, John.....	70	1
McEver, Andrew.....	124	1
Maguire bills, hearings relative to.....	206	1
Maury, J. H.....	9	1
Meadors, Zaddock.....	146	1
Meeha, Catherine Barry.....	143	1
Members' pay, to enforce deductions for absence.....	126	1
Merchandise, report on imported, 1890-1893.....	96	(*)
in bond transported through Canada, for information.....	92	1
Merchant marine, hearing on Maguire bills relating to.....	206	1
Merritt, J.....	134	1
Messages of Presidents of United States, compilation of.....		37
Metropolitan Railroad Company.....	68	1
Meuillon, Alphonse.....	111	1
Mexico, relative to correspondence with, on question of Zona Libre.....	152	1
Miller, John.....	16	1
Mineral Resources of United States (1892).....		4
(1893).....		28
Mint, relative to site for, at Philadelphia.....	160	1
Monograph of Geological Survey. (See Geological Survey.)		
Moore, Stephen.....	79	1
Murphy, J. S.....	9	1
Mutchler, William, eulogies on.....	93	11
N.		
Naval vessels, relative to speed premiums paid on.....	89	1
Neeley, W. W.....	45	1

* Bound in vol. 25, House Executive Documents.

Subject.	No.	Vol.
Neville, B. B	186	1
Newport, N. C., Primitive Baptist Church of	146	1
New York City, inquiry relative to condition, etc., of public buildings and grounds	46	1
Nixon, H. C	146	1
Norris, B. T., report of Court of Claims	194	1
North American Ethnology. (See Ethnology.)		
O.		
Official Records of War of Rebellion (vol. 43, part 1)		7
(vol. 43, part 2)		8
(vol. 44)		12
(vol. 45, part 1)		16
(vol. 45, part 2)		17
(vol. 46, part 1)		33
(vol. 46, part 2)		34
(vol. 46, part 3)		35
Official Register (legislative, judicial, and executive), part 1		2
(postal service), part 2		3
Oglesby, L. T	146	1
Oklahoma, relative to certain leases of Indian lands in	87	1
Orme, Walter	104	1
P.		
Pacific Coast, resolution relative to certain river and harbor improvements on	207	1
Palmer, E. A	27	1
Patrick, J. M	53	1
Patton, Henry	71	1
Pelliter, E. W	146	1
Perkins, R. S	58	1
Permanent specific and indefinite appropriations	86	1
Perry, O. H	105	1
Phelan, J. G	52	1
Phetzing, Cornelius	195	1
Philadelphia, Pa., relative to site for new mint building at	160	1
letter of Commissioner relative to establishing hatchery at	198	1
Pierce, J. F	128	1
Piggott, Jesse	147	1
Porche, Louis V	129	1
Powell, Mary	153	1
Powell, W. M	118	1
Premiums, relative to, paid on naval vessels for speed	89	1
Presidents of United States, compilation of messages of		37
Priddy, John D	146	1
Primitive Baptist Church of Newport, N. C	146	1
Private claims, index of, from Forty-seventh to Fifty-first Congress		40
R.		
Raiford, Robert	190	1
Raither, James	133	1
Rowlins, M	9	1
Reid, William	148	1
Rowlett, John W	183	1
Russell, Thomas W	50	1
Ryan, Thomas	67	1
S.		
St. Charles College, St. Charles, St. Charles County, Mo	145	1
Sanford, Sylvanus	139	1
Saxson, W. G	61	1
Seamen, hearings relative to Maguire bills relating to	206	1

Subject.	No.	Vol.
Sells, Holmes	129	1
Sergeant-at-Arms. (See House of Representatives.)		
Show, George	134	1
Shumate, A. B. and William	155	1
Shumate, James H	108	1
Simmons, H. S	190	1
Smith, John	151	1
Smithsonian Institution, report of 1893, part 1		29
part 2		30
Sneuffer, A. T	98	1
South Carolina, employés in Treasury Department from	69	1
Speed, M. E	66	1
Stafford, John	61	1
Stewart, F. B	100	1
Stone, Malinda	51	1
Stonebaker, G. E	147	1
T.		
Talbott, R	102	1
Terry, T. O	155	1
Thompson, P. H	27	1
Tipton, M	9	1
Tolson, John J	146	1
Treasury notes, resolution of inquiry relative to issuance of certain	113	1
U.		
Ubele, Christian	83	1
United States Fish Commission. (See Fish Commission.)		
United States Geological Survey. (See Geological Survey.)		
Utah, laws passed by legislature of	169	1
Utz, Alice	170	1
V.		
Ventilation, to promote, of House of Representatives by employment of night force	162	1
Vinton, M. C	112	1
W.		
Wabash River, report of commission on damage to food fish in	196	1
Wallace, William	11	1
War of Rebellion, official records of (vol. 43, part 1)		7
(vol. 43, part 2)		8
(vol. 44)		12
(vol. 45, part 1)		16
(vol. 45, part 2)		17
(vol. 46, part 1)		33
(vol. 46, part 2)		34
(vol. 46, part 3)		35
Washington. (See District of Columbia.)		1
Washington and Georgetown Railroad Company	72	1
Wasson, J. R	197	1
Wasson, Richard F	78	1
Waste paper, account of sale of, by Doorkeeper	23	1
Waters, Robert	85	1
Weather Bureau, report of, 1893		31
Wichita Reservation, relative to certain lease of lands in	87	1
Wilhite, H	76	1
Williams, M. R	124	1
Wolfson, Jacob A	202	1
Womack, J. M	14	1
Wood, A. M	165	1
Wood, D T	182	1

Subject.	No.	Vol.
Woodard, W. H -----	30	1
Woods, B. R -----	131	1
Woods, S. P -----	115	1
Woolsey, Wm -----	135	1
World's Columbian Exposition, report of auditor to Board of Directors -----	103	1
Z.		
Zona libre, relative to correspondence with Mexico on subject of ----	152	1

BULLETINS

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Nos. 102 to 106

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WASHINGTON, D. C.

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 States | geological survey | no. 102 | [Seal of the department] |
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 director | — | A | catalogue and bibliography | of | North Amer-
 ican Mesozoic invertebrata | by | Cornelius Breckinridge Boyle |
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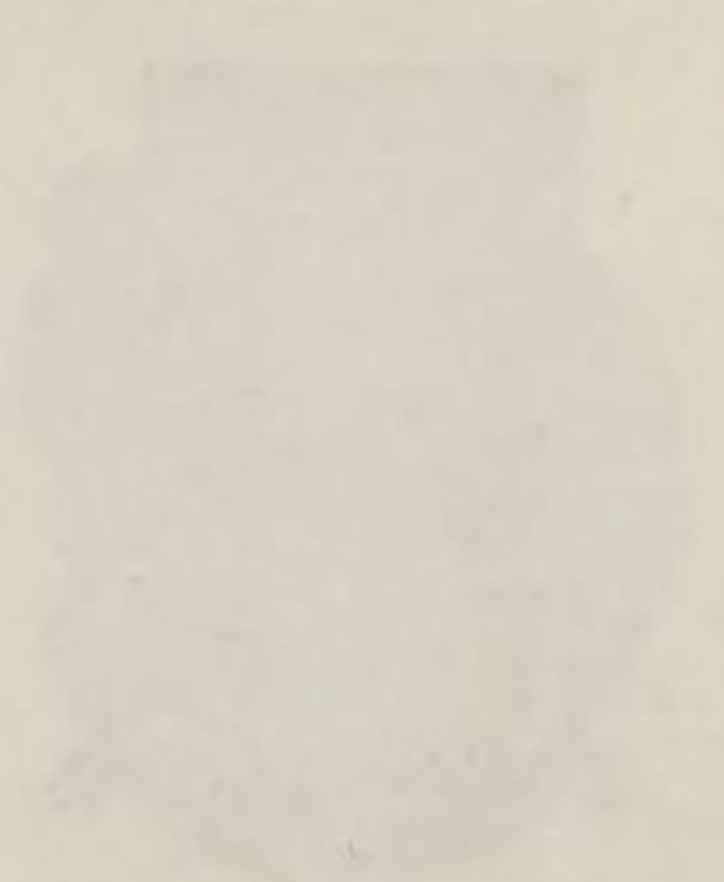
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LETTERS OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
WASHINGTON, D. C., *June 15, 1892.*

SIR: I have the honor to transmit herewith the manuscript of a Catalogue and Bibliography of North American Mesozoic Invertebrates, which has been prepared by Dr. C. B. Boyle, of this division, in accordance with the plan approved by you at the time it was undertaken.

Very respectfully,

C. A. WHITE,
Geologist in Charge.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

U. S. GEOLOGICAL SURVEY,
DIVISION OF MESOZOIC INVERTEBRATE PALEONTOLOGY,
WASHINGTON, D. C., *June 15, 1892.*

SIR: I herewith transmit to you the MS. of a bibliography and catalogue of the known North American Mesozoic invertebrates, upon the preparation of which I have been engaged, together with other pressing work, for the past several years. I have encountered the usual difficulties that attend a work of this kind, and am quite prepared for the discovery of errors by those who are familiar with the subject and who shall examine this work. Mr. T. W. Stanton, of the Survey, has been of the greatest assistance to me, especially as regards foreign publications, and to you, sir, I am largely indebted for whatever of value the work may possess.

Very respectfully,

C. B. BOYLE.

Dr. C. A. WHITE,
Chief of Division.

LETTER TO THE EDITOR

Dear Sir,

I have the honor to acknowledge the receipt of your letter of the 10th inst.

in relation to the matter of the 10th inst.

and in reply to inform you that the same has been forwarded to the proper authorities for their consideration. I am, Sir, very respectfully,
Yours, very truly,
C. B. Boye

Very respectfully,

C. B. Boye

Very respectfully,

John J. W. Foster

Chairman of the Board of Directors

Very truly,

W. E. Wood

Chairman of the Board of Directors

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John J. W. Foster

Chairman of the Board of Directors

PREFACE.

This work is divided into two parts, Part I being devoted to bibliography and Part II to a catalogue of species and genera.

Part I is intended to embrace a notice of every work, wherever published, that contains the systematic publication of any invertebrate species which has by any author been referred to the Mesozoic. All works containing only lists or mere mention of species by name are omitted, but those containing names accompanied by figures, even if without descriptions, are included.

In the case of serial publications both the title page date and the date of actual issue are given if the latter is known. In other cases the title page date is given as the true date of issue, even though within the compiler's personal knowledge it is wrong.

Some difficulty has arisen from the fact that in some of the earlier publications of species authors have referred certain formations to the Tertiary that are now assigned to the Cretaceous; and it is possible that some of these publications have been omitted from the list, but the republication of the same species as Cretaceous will appear in the proper place.

Part II consists of a catalogue of all the names that have been applied to the genera and species of invertebrates obtained from North American rocks and referred by any author to the Mesozoic. The arrangement is alphabetical and chronological. The entries contain the generic and specific names as they have been used by authors, no attempt having been made to correct erroneous spelling.

The specific name is repeated in each entry which is required by every separate publication of the species, but a separate entry for the generic and subgeneric name is not repeated. Names of groups higher than genera are omitted.

The localities mentioned are in all cases those given by the respective authors. Because of subsequent changes in state and territorial boundaries the reader may find difficulty in recognizing them. In such cases he is referred to Bulletin 13 of the U. S. Geological Survey, in which the successive changes of those boundaries are recorded.

In referring species to their respective formations the subdivisions mentioned by certain authors are not given. This omission is thought to be necessary because of the great number of local names that have been applied at different times, many of which have become obsolete. This is especially the case with the Cretaceous formations. In some cases the reference of species by authors to the Cretaceous is changed to Tertiary and in others from Tertiary to Cretaceous. In doing this the author has followed to a great extent the correlation of Dr. C. A. White, as published in Bulletin U. S. Geological Survey, No. 82, Washington, 1891. As in that work, the Laramie is provisionally included in the Cretaceous, together with certain other formations that are regarded as transitional.

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— Descriptions of new Cretaceous invertebrate fossils from Kansas and Texas.

Proc. U. S. Nat. Mus., vol. 2, for 1879, pp. 292-298, pls. 2-6. Wash., 1880.

— Description of a new Cretaceous Pinna from New Mexico.

Proc. U. S. Nat. Mus., vol. 3, for 1880, pp. 47, 48. Wash., 1881.

— Description of a new Cretaceous Pinna from New Mexico.

Smithson. Misc. Coll., vol. 22, pp. 47-48. Wash., 1882. (Proc. U. S. Nat. Mus., vol. 3, for 1880. Wash., 1881.)

White, C. A.—Continued.

- Description of a very large fossil gasteropod from the state of Pueblo, Mexico.

Smithson. Misc. Coll., vol. 22, pp. 140-142, pls. 2. Wash., 1882. (Proc. U. S. Nat. Mus., vol. 3, for 1880. Wash., 1881.)

- Descriptions of new invertebrate fossils from the Mesozoic and Cenozoic rocks of Arkansas, Wyoming, Colorado, and Utah.

Proc. U. S. Nat. Mus., vol. 3, for 1880, pp. 157-165. Wash., 1881.

- Descriptions of new invertebrate fossils from the Mesozoic and Cenozoic rocks of Arkansas, Wyoming, Colorado, and Utah.

Smithson. Misc. Coll., vol. 22, pp. 157-162. Wash., 1882.=Proc. U. S. Nat. Mus., vol. 3, for 1880. Wash., 1881.

- Contributions to Invertebrate Paleontology No. 4. Fossils of the Laramie group.

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Hayden, for 1878, part 1, pp. 49-103, pls. 20-30. Wash., 1883.

- Contributions to Invertebrate Paleontology No. 7. Jurassic fossils from the western territories.

Twelfth Ann. Rep. U. S. Geol. Sur. Terr., Hayden, for 1878, part 1, pp. 143-153, pls. 37 and 38. Wash., 1883.

- On certain Cretaceous fossils from Arkansas and Colorado.

Proc. U. S. Nat. Mus., vol. 4, for 1881, pp. 136-139, 1 plate. Wash., 1882.

- On certain Cretaceous fossils from Arkansas and Colorado.

Smithson. Misc. Coll., vol. 22, pp. 136-139, pl. 1. Wash., 1882.=Proc. U. S. Nat. Mus., vol. 4, for 1881. Wash., 1882.

- New molluscan forms from the Laramie and Green river groups, with discussion of some associated forms heretofore known.

Proc. U. S. Nat. Mus., vol. 5, for 1882, pp. 94-99, pls. 3 and 4. Wash., 1883.

- Contributions to Invertebrate Paleontology No. 2. Cretaceous fossils of the western states and territories.

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Hayden, for 1878, part 1, pp. 5-39, pls. 11-18. Wash., 1883. (Pl. 18, illustrations of some of the species described by Dr. B. F. Shumard in Trans. St. Louis Acad. Sci., vol. 1, pp. 590-610).

- Contributions to Invertebrate Paleontology No. 5. Triassic fossils of southeastern Idaho.

White, C. A.—Continued.

Twelfth Ann. Rep. U. S. Geol. Sur. Terr., Hayden, for 1878, part 1, pp. 105-118, pls. 31 and 32. Wash., 1883.

- A review of the non-marine fossil mollusca of North America.

Third Ann. Rep. U. S. Geol. Sur., pp. 403-550, pls. 1-32. Wash., 1883.

- Descripcion de un gran fosil gasteropodo del Estado de Pueblo, Mexico.

La Naturaleza, tomo 6, pp. 219-221. Mexico, 1884.

- A review of the fossil ostreidæ of North America, and a comparison of the fossil with the living forms. With appendices by Prof. Angelo Heilprin and Mr. John A. Ryder.

Fourth Ann. Rep. U. S. Geol. Sur., pp. 273-430, pls. 34-82. Wash., 1884.

- On Mesozoic fossils.

Bull. U. S. Geol. Sur. No. 4, pp. 1-36 (89-124), pls. 1-9. Wash., 1884.

Part 1. Description of certain aberrant forms of the Chamidæ from the Cretaceous rocks of Texas.

Part 2. On a small collection of Mesozoic fossils collected in Alaska by Mr. W. H. Dall, of the United States Coast Survey.

Part 3. On the Nautiloid genus *Enclimatoceras* Hyatt, and a description of the type species.

- On new Cretaceous fossils from California.

Bull. U. S. Geol. Sur., vol. 3, No. 22, pp. 1-25 (348-373) pls. 1-5. Wash., 1885.

- Remarks upon certain California fossils which have been identified with eastern species.

Bull. U. S. Geol. Sur. No. 15, pp. 27-31. Wash., 1885.

- On the fresh water invertebrates of the North American Jurassic.

Bull. U. S. Geol. Sur., vol. 4, No. 29, pp. 1-41 (689-725) [9] pls. 1-4. Wash., 1885.

- On new generic forms of Cretaceous mollusca and their relation to other forms.

Proc. Acad. Nat. Sci., Phila., vol. [39], pp. 32-37, pls. 2. Phila., 1887.

- On invertebrate fossils from the Pacific coast.

Bull. U. S. Geol. Sur. No. 51, pp. 1-102 (432-532), pls. 1-14. Wash., 1889.

Part 1. New fossil mollusca from the Chico-Tejon series of California, pp. 11-27.

Part 2. Equivalents of the Chico-Tejon series in Oregon and Washington, pp. 28-32.

Part 3. Cretaceous fossils from Vancouver island region, pp. 35-48.

Part 4. Molluscan fauna of the Puget group, pp. 49-63.

Part 5. Mesozoic mollusca from the southern coast of the Alaskan peninsula, pp. 64-70.

White, C. A.—Continued.

- Remarks on the genus *Aucella*, with especial reference to its occurrence in California.

Mon. U. S. Geol. Sur. No. 13, appendix to chap. 5, pp. 226-232, pls. 3 and 4. Wash., 1889.

Whiteaves, J. F. Notes on the Cretaceous fossils collected by Mr. James Richardson at Vancouver and the adjacent islands.

Geol. Sur. Canada Rep. Prog. for 1873-74, pp. 260-268, pl. 1. Montreal, 1874.

- On some invertebrates from the coal-bearing rocks of the Queen Charlotte island, collected by Mr. James Richardson, in 1872.

Geol. Sur. Canada, Mesozoic fossils, vol. 1, pt. 1, pp. 1-92, pls. 1-10. Montreal, 1876.

- Notes on some of the fossils collected during the expedition.

Geol. Sur. Canada, Rep. Prog. for 1875-76, appendix 2, pp. 96-106. Montreal, 1877.

- On some Jurassic fossils from the coast ranges of British Columbia.

Canadian Nat. and Geol., vol. 16 (8, 2d ser.) No. 7, pp. 400-410. Montreal, 1878.

- Notes on some Jurassic fossils collected by Mr. G. M. Dawson in the coast ranges of British Columbia.

Geol. Surv. Canada, Rep. Prog. 1876-77, pp. 150-159. Montreal, 1878.

- On the fossils of the Cretaceous rocks of Vancouver and adjacent islands in the Strait of Georgia.

Geol. Sur. Canada. Mesozoic fossils, vol. 1, pt. 2, pp. 93-190, pls. 11-20. Montreal, 1879.

- On the lower Cretaceous rocks of British Columbia.

Proc. and Trans. Roy. Soc., Canada, vol. 1, for 1882 and 1883, section 4, pp. 81-86 (3 wood cuts). Montreal, 1883.

- On the fossils of the coal-bearing deposits of the Queen Charlotte islands, collected by Dr. G. M. Dawson in 1878.

Geol. and Nat. Hist. Sur. of Canada. Mesozoic fossils, vol. 1, pt. 3, pp. 191-262, pls. 21-32. Montreal, 1884.

- Description of a new species of ammonite from the Cretaceous rocks of Fort St. John, on Peace river.

Proc. and Trans. Roy. Soc., Canada, vol. 2, section 4, pp. 239, 240. Montreal, 1885.

Whiteaves, J. F.—Continued.

- Note on a Decapod crustacean from the upper Cretaceous of Highwood river, Alberta.

Proc. and Trans. Roy. Soc., Canada, vol. 2, section 4, pp. 237-238. Montreal, 1885.

- Report on the invertebrata of the Laramie and Cretaceous rocks of the vicinity of the Bow and Belly rivers and adjacent localities in the northwest territory.

Geol. and Nat. Hist. Sur., Canada. Contributions to Canadian paleontology, vol. 1, pt. 1, pp. 1-89, pls. 1-11. Montreal, 1885.

- Notes on some Mesozoic fossils from various localities on the coast of British Columbia, for the most part collected by Dr. G. M. Dawson in the summer of 1885.

Geol. and Nat. Hist. Sur., of Canada, vol. 11, (new series). Ann. Report for 1886, pp. 108-114 B. App. I to Dr. G. M. Dawson's report on a geological examination of the northern part of Vancouver island and adjacent coasts.

- The fossils of the Triassic rocks of British Columbia.

- On some Cretaceous fossils from British Columbia, the northwest territory, and Manitoba.

Cont. to Canadian Paleont., Nos. 3, 4. Vol. 1, pt. 2, pp. 91-196, pls. 12-26. Montreal, 1889.

Whitfield, R. P. Descriptions of new fossils.

Rep. Rec. Black hills of Dakota, Ludlow, pp. 103-104, pl. 1. Washington, 1875.

- Descriptions of new species of fossils.

Rep. Rec. Carroll, Montana Terr., on the upper Missouri, to the Yellowstone National Park, and return, made in the summer of 1875, by William Ludlow, pp. 141-145, pls. 1-2. Wash., 1876.

- Preliminary report on the paleontology of the Black hills.

U. S. Geogr. and Geol. Sur. Rocky Mt. region. J. W. Powell, pp. 49. Wash., 1877.

- Paleontology of the Black hills of Dakota.

Report on the geology and resources of the Black hills of Dakota.

U. S. Geogr. and Geol. Survey Rocky Mt. region. J. W. Powell, pp. 325-468, pls. 1-16. Wash., 1880.

- Brachiopoda and lamellibranchiata of the Raritan clays and greensand marls of New Jersey.

Mon. U. S. Geol. Sur., vol. 9, pp. 1-20, and 1-264, pls. 1-35. Wash., 1885.

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PART II.

LIST OF FOSSILS.

Acar (sub. gen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 78. Wash., 1876. F. B. Meek.

Acella (sub. gen. Hald.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 533. Wash., 1876. F. B. Meek.

— (**Haldeman**) White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 714. Wash., 1878. C. A. White.

— **haldemani** n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 714. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Valley of Bear river, near its confluence with Sulphur creek, Wyoming.

— **haldemani** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Mellis station, Wyoming.

— **haldemani** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 84, pl. 30, figs. 9a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

— sp. undet. **Whiteaves**. (1885.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 1, p. 13. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: North or second branch of the Milk river, Canada.

Acerviclausula n. g. G. & H. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-1860, p. 403. Phila., 1858-1860. Gabb & Horn.

— **vermicularis** n. s. G. & H. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-1860, p. 403, pl. 69, figs. 42-44. Phila., 1858-1860. Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, New Jersey.

Acila (sub. gen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 98. Wash., 1876. F. B. Meek.

Acmaea (Esch.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2. Phila., 1869. W. M. Gabb.

Acmaea—Continued.

— **occidentalis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 295-296, pl. 18, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne river, near the Black hills.

— ? **papillata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 296-297, pl. 31, figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fox hills, Dakota.

— ? **parva** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 296, pl. 18, figs. 1a-c, and fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On either the Yellowstone or the Cheyenne river.

— ? **tejonensis** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 172-173, pl. 28, fig. 56. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Tejon, Cal.

— sp. undet. **Whiteaves**. (1879.)

Geol. Sur. Can.; Mes. Foss. vol. 1, pt. 2, pp. 130-131, pl. 16, figs. 6, 6a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, two miles and a quarter up, Vancouver island.

Acrochordiceras n. g. Hyatt. (1877.)

Rep. Geol. Expl. 40th Parallel, vol. 4, pt. 1, p. 124. Wash., 1877. Alpheus Hyatt.

— (?) **carlottense** n. s. **Whiteaves**. (1889.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 2, pp. 141-142, pl. 19, fig. 1. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Houston Stewart channel, Q. C. I.

— **hyatti** n. s. Meek. (1877.)

Rep. Geol. Expl. 40th Parallel, vol. 4, pt. 1, pp. 124-126, pl. 11, figs. 5, 5a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: New Pass, Desatoya mountains, Nevada.

Acroloxus (Beck) Meek. (1876.)

Rep. U. S. Geol. Sur., Terr., vol. 9., p. 543 Wash., 1876. F. B. Meek.

Acroloxus—Continued.

- **minutus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 543-544,
pl. 40, fig. 10. Wash., 1876. F. B. Meek.
Formation: Probably lower Eocene (Cretaceous).
Location: Three miles below Fort Union.
- **minutus** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 83. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Fort Union, in the upper Mis-
souri river region.
- **minutus** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 45, pl. 24,
fig. 27. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Fort Union.
- **minutus** (M. & H.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can.; Cont. Can.
Paleont., vol. 1, pt. 1, p. 17. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: North or Second branch of the Milk
river; Gooseberry canyon, St. Mary river, and
Old Man river, two miles above Rye Grass flat;
Pincher creek, Canada.
- **radiatulus** n. s. Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can.; Cont. Can. Pa-
leont., vol. 1, pt. 1, p. 17, pl. 3, figs. 1, 1a. Mon-
treal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Mouth of Blind Man river, township
39, range 27, west of 4th principal meridian,
Canada.
- Acrosmilia** (sub. gen. d'Orb.) Gabb.
(1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 207. Phila.,
1864. W. M. Gabb.
- Actæon** (Mont.) Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser.,
1858-1860, p. 207. Phila., 1858-1860. T. A.
Conrad.
- **attenuatus** (M. & H.) Meek.
(1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 281-282,
pl. 19, figs. 17, a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, 150 miles from its
mouth.
- **attenuatus** (M. & H.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur., Can.; Cont. Can. Pa-
leont., vol. 1, pt. 1, p. 46. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Old Wives creek, township 10, range
11 west of 3d principal meridian, Canada.
- **concinus** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 390,
pl. 3, figs. 4a-d. Cambridge and Boston, 1855.
Hall & Meek.
Formation: Cretaceous.
Location: Sage creek; Great Bend of the Missouri.

Actæon—Continued.

- **cretacea** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, pp. 318-319.
Phila., 1862. Wm. M. Gabb.
Formation: Cretaceous.
Location: Crosswicks, New Jersey.
- **impressus** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 142-143, pl.
21, fig. 106. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North fork of Cottonwood creek, Cal.
- **inornatus** n. s. White. (1889.)
Bull. U. S. Geol. Sur. No. 51, pp. 15-16, pl. 4,
figs. 16-18. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Near Pence's ranch, Butte county, Cal.
- **intercalaris** n. s. Meek. (1876.)
Rep. Expl. Exped. Santa Fé, New Mexico, to
junction of Grand and Green rivers, Macomb,
p. 129, pl. 2, figs. 4a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Río de la Plata.
- **modicellus** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser.,
1858-1860, p. 287. Phila., 1858-1860. T. A.
Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- **ovoidea** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila. for 1861, p. 319.
Phila., 1862. Wm. M. Gabb.
Formation: Cretaceous.
Location: Crosswicks, New Jersey.
- **subellipticus** n. s. M. & H. (1876.)
Proc. Acad. Nat. Sci., Phila. for 1856, pp. 63-64.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Crow creek, near Black Hills, Nebraska.
- **subellipticus** (M. & H.) Meek.
(1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 280-281,
pl. 19, fig. 16. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Crow creek, near the Black hills,
Dakota.
- **woosteri** n. s. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 184. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Mouth of Saint Vrain creek, Colorado.
- **woosteri** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 225. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near White river Indian Agency,
Colorado.
- **woosteri** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 304, pl. 7, figs. 9a, c. Wash., 1879.
C. A. White.
Formation: Cretaceous.
Location: Near the confluence of the Saint Vrain
and South Platte rivers, northern Colorado.
Also, from Rio San Juan, southwestern Colorado.

Actæon—Continued.— **sp. undet. Whiteaves. (1876.)**

Geol. Sur. Can.; Mes. Foss. vol. 1, pt. 1, p. 53.
Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte island.

Actæonella (d'Orb.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 173. Phila.,
1869. W. M. Gabb.

— **dolium n. s. Roemer. (1849.)**

Texas, p. 411. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Texas.

— **dolium Roemer. (1852.)**

Die Kreide von Texas, p. 43, Taf. 4, fig. 4. Bonn,
1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Texas.

— **oviformis n. s. Gabb. (1869.)**

Geol. Sur. Cal., Paleont., vol. 2, p. 173, pl. 28,
fig. 58. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

Actæonina (D'Orb.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-
1860, p. 299. Phila., 1858-1860. Wm. M. Gabb.

— **biplicata (M. & H. sp.) Gabb. (1860.)**

Proc. Acad. Nat. Sci., Phila. for 1860, p. 93, pl. 2,
fig. 13. Wm. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, New Jersey.

(= Actæon biplicata M. & H.)

— **californica n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 114, pl. 19,
fig. 68. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Northeast of Martinez; two miles north
of Benicia; eight miles north of Yreka, Cal.

— **naticoides n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 299, pl. 48, fig. 2. Phila., 1858-1860.
Wm. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, and Mullica Hill,
New Jersey.

— **prosocheila n. s. White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 184. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of Saint Vrain creek, Colorado.

— **prosocheila White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 305, pl. 7, figs. 10a, b. Wash., 1879.
C. A. White.

Formation: Cretaceous.

Location: Confluence of the Saint Vrain and South
Platte rivers, northern Colorado.

— **? pupoides n. s. Gabb. 1864.**

Geol. Sur. Cal., Paleont., vol. 1, pp. 113-114, pl. 19,
fig. 67. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Shasta
county, Cal.

Actæonina—Continued.— **pupoides Gabb. (1869.)**

Geol. Sur. Cal., Paleont., vol. 2, p. 173, pl. 28,
fig. 57. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— **(?) sp. undet. Whiteaves. (1874.)**

Geol. Sur. Canada; Rep. Prog. for 1873-74, p. 262.
Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two
and one-half and two and one-fourth miles up.

— **sp. undet. (1876.)**

Geol. Surv. Can.; Mes. Foss. vol. 1, pt. 1, p. 53.
Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

Acteon (Solidula) attenuata n. s. M. & H.

(1858.)

Proc. Acad. Nat. Sci., Phila. for 1858, p. 54. Phila.,
1859. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river

Actinoceramus n. sub. gen. Meek.

(1864.)

Check list Invert. Foss. N. Am. Cret. and Jur.
Smithson. Misc. Coll., vol. 7, No. 177, p. 32.
Wash., 1864. F. B. Meek.

Actinophorus n. sub. gen. Meek. (1864.)

Am. Jour. Sci., 2d. ser., vol. 37, p. 218. New Ha-
ven, 1864. F. B. Meek.

Admete (Möller) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of
100th meridian, vol. 4, pt. 1, p. 198. Wash.,
1875. C. A. White.

— **? gregaria n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 501-502. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— **? rhomboides n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 501. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— **? subfusiformis n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 502. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— **(Admetopsis) gregaria (Meek) White. (1875.)**

Rep. Geogr. and Geol. Expl. and Sur. west of
100th meridian, vol. 4, pt. 1, pp. 198-199, pl. 18,
figs. 5a, b. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: North fork of Virgin river, Utah.

Admetopsis (sub. gen. Meek) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of
100th meridian, vol. 4, pt. 1, p. 198. Wash.,
1875. C. A. White.

Admetopsis—Continued.

- **gregaria** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **rhomboides** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **rhomboides** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 317-318, pl. 9, figs. 6a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **subfusiformis** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **subfusiformis** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 319-318, pl. 9, fig. 7a. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- Ænona** n. g. Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1871. T. A. Conrad.
- **eufalensis** Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1871. T. A. Conrad.
Formation: Cretaceous.
- **eufaulensis** (Con.) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 168-169, pl. 23, figs. 2, 3. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **papyria** n. s. Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **papyria** (Con.) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 169-170, pl. 23, fig. 4. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- Æora** n. g. Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 72. Phila., 1871. T. A. Conrad.
- **cretacea** n. s. Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 72, pl. 3, fig. 8. Phila., 1871. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **cretacea** (Con.) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 167-168, pl. 23, figs. 16, 17. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

Æora—Continued.

- n. g. Conrad. (1870.)
Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 72. Phila., 1872. T. A. Conrad.
- Afer** n. sub. gen. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332. Phila., 1855-1858. T. A. Conrad.
- Aguileria** n. g. White. (1887.)
Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, pp. 35-37. Phila., 1887. C. A. White.
- **cumminsi** n. s. White. (1887.)
Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, p. 37, pl. 2, figs. 1-3. Phila., 1887. C. A. White.
Formation: Cretaceous.
Location: Four miles south of Lewisville, Texas.
- Akera** (Muller) Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. region. Prelim. Rep. Paleont., Black hills, p. 38. Wash., 1877. R. P. Whitfield.
- **glans-oryza** n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. region. Prelim. Rep. Paleont. Black hills, pp. 38, 39. Wash., 1877. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near French creek, Black hills, Dakota.
- **glans-oryza** Whitfield. (1880.)
Rep. Geol. Black hills of Dakota, pp. 437-438, pl. 12, fig. 25. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near French creek, Black hills, Dakota.
- Alaba** (sub. gen. H. & A. Ad.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 335. Wash., 1876. F. B. Meek.
- Alasmodonta** (sub. gen. Say) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 113. Wash., 1876. F. B. Meek.
- Alcyonium** ? Morton. (1829.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser. 1827-1831, p. 125. Phila., 1827-1831. S. G. Morton.
Form: Cretaceous.
Location: Big Timber creek, Gloucester county, New Jersey.
- ? Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 81. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Alabama.
- Alecto** G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 172. Phila., 1862, 1863. Gabb & Horn.
- **regularis** n. s. G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 172, [pl. 21], fig. 63. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: New Jersey.

Alectryonia (sub. gen. Fischer) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 11. Wash.
1876. F. B. Meek.

Alipes (sub. gen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 320. Wash.,
1876. F. B. Meek.

Alveolites (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 246. New
Haven, 1830. S. G. Morton.

— **cepcularis** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 80. Phila.,
1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245. New
Haven, 1830. S. G. Morton.

Formation: Ferruginous sand (Cretaceous).

Location: United States.

Amauropsis (Mörch) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 109. Phila.,
1864. W. M. Gabb.

— **alveata** (Con.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 110, pl. 19, fig.
59, plate 21, fig. 111. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: San Diego; Martinez; Clayton; Cañada
de los Alizos, near Fort Tejon; Curry's, south
of Mount Diablo, Cal.

— **oviformis** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 109-110, pl.
19, fig. 63. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan Springs, Tehama county, Cal.

— **paludinæformis** (H. & M. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 318-319,
pl. 19, figs. 15a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Sage creek and Cheyenne river, Dakota.

— **paludinæformis** (H. & M. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 296.
Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **paludinæformis** (H. & M. sp.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 431-432,
pl. 12, fig. 16. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Box-
elder creek, Black hills.

— **suciensis** n. s. Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, pp. 123,
124, pl. 16, fig. 1. Montreal, 1879. J. F. White-
aves.

Formation: Cretaceous.

Location: Nanaimo river, two and a half miles
up, Vancouver island, Sucia islands.

Amauropsis—Continued.— **tenuistriata** n. s. Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, pp. 48,
49, pl. 9, figs. 4, 4a. Montreal, 1876. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **tenuistriata** Whiteaves. (1884.)

Geol. and Nat. His. Sur. Can.; Mes. Foss., vol. 1,
pt. 3, p. 216, pl. 28, fig. 3. Montreal, 1884.
J. F. Whiteaves.

Formation: Cretaceous.

Location: Shingle bay, on Moresby island; bay
east of Alliford bay; South island; all in Skide-
gate inlet.

Ambonicardia n. g. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 24, 25. Wash.,
1885. R. P. Whitfield.

— **cookii** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 25, pl. 2, figs.
11-14. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Clays at Sayre and Fisher's banks near
Sayreville, N. J., and at clay banks of R. N. &
H. Valentine, near Woodbridge, and at East
Brunswick, New Jersey.

Ammonceratites [Lam. ?] Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-
1842, p. 212. Phila., 1839-1842. S. G. Morton

— **conradi** n. s. Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-
1842, pp. 212, 213, pl. 10, fig. 1. Phila., 1839-
1842. S. G. Morton.

Formation: Cretaceous.

Location: Near Arneytown, New Jersey.

— **conradi** Morton. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843,
p. 109. Phila., 1843. S. G. Morton.

Formation: Cretaceous.

Location: Marl pit near Arneytown, New Jersey.

Ammonites abyssinus n. s. Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser.,
1839-1842, p. 209, pl. 10, fig. 4. Phila., 1839-
1842. S. G. Morton.

Formation: Cretaceous.

Location: Great Bend of the Missouri river
(Lat. 43° 46' N.)

— **abyssinus** Morton. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843
p. 107. Phila., 1843. S. G. Morton.

Formation: Cretaceous.

Location: Upper Missouri.

— **acuto-carinatus** n. s. Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, pp. 209,
210, pl. 3, fig. 1. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Cross Timbers, Texas.

Ammonites—Continued.**— astierianus (d'Orb.) Eichwald. (1871.)**

Geog. Paleont., Bemerk. Halb. Mang. Aleutischen Inseln., pp. 143-145, Taf. 8, fig. 3; Taf. 9, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Chasik island, Tukusitmo bay, Alaska.

— ausse[e]anus (Hauer) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 25, pl. 3, figs. 16, 17. Phila., 1864. W. M. Gabb.

Formation: Triassic.

— barnstoni n. s. Meek. (1859.)

N. W. Terr.; Rep. Prog. Assin. and Saskat. Expl. Exped. H. Y. Hind, p. 184, pl. 1, figs. 1-3. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: Valley of Mackenzie river, Canada.

— batesii n. s. Trask (1855.)

Proc. Cal. Acad. Nat. Sci., vol. 1, 1st ser., p. 40. San Francisco, 1854-1856. J. B. Trask.

Formation: Secondary [Cretaceous].

Location: Arbuckle's diggings, Shasta county, Cal.

— batesii (Trask) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 67-68, pl. 13, figs. 16, 16a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Arbuckle's diggings, Shasta county, Cal.; North fork of Cottonwood creek, Shasta county; Bald hills, Shasta county; Benicia, and at Curry's, south of Mount Diablo, Cal.

— batesii (Trask). Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 1, p. 132, pl. 20, figs. 9, a, pl. 21, figs. 10, a, b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— belknapii n. s. Marcou. (1858.)

Geol. N. Am., p. 34, pl. 2, figs. 1, a, b. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Near Preston, Texas, in the bed of a little creek flowing into Red river.

— billingsi n. s. Meek. (1859.)

N. W. Terr.; Rep. Prog. Assin. and Saskat. Expl. Exped. H. Y. Hind, pp. 184-185, pl. 2, figs. 4-6. Toronto, 1859. F. B. Meek.

Formation: Cretaceous. ?

Location: Valley of Mackenzie's river, Canada.

— billingsianus n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 26-37, pl. 5, fig. 20. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: E. Range, Humboldt, Nevada.

— billingsianus Gabb. (1889.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 8-9, pl. 5, fig. 3. Phila., 1870. Wm. M. Gabb.

Ammonites—Continued.**— bplex ? (Sow.) Grewingk. (1850.)**

Verhand. der Russisch. Kaiser. Mineral. Gesells.; Jahrg. 1848-1849, pp. 346-347, pl. 4, figs. 2, a, d. St. Petersburg, 1850. C. Grewingk.

Formation: Jurassic.

Location: Katmai bay, south coast of Alaska peninsula.

— blakei n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 24-25, pl. 4, figs. 14, 15. Phila., 1864. W. M. Gabb.

Formation: Triassic.

— borealis n. s. Morton. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843, p. 107. Phila., 1843. S. G. Morton.

Formation: Cretaceous.

Location: Upper Missouri.

— brazoensis n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 594. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Shovel creek, near Austin; Grayson and Fannin counties; McLennan county, Texas; and from the vicinity of Fort Washita.

— brewerii n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 62, pl. 10, fig. 7. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Shasta county (Div. A).

— brewerii Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 130-131, pl. 20, fig. 5; pl. 19, figs. 5a, b, 6, a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— brewerii (Gabb) Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, pp. 21-24, pl. 1, figs. 2, 2a, 3, 3a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte island.

— carlottensis n. s. Whiteaves. (1876.)

Geol. Surv. Can.; Mes. Foss., vol. 1, pt. 1, pp. 38-39, pl. 6, fig. 5, p. 38. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— carteroni (d'Orb.) Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. aleutischen Inseln. pp. 149-150, Taf. 7, fig. 5; Taf. 10, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: On an island in Kenai bay, Alaska.

— cheyennensis n. s. Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., pp. 578-579, pl. 7, fig. 2. Phila., 1852. D. D. Owen.

Formation: Cretaceous.

Location: Fox Hills, Nebraska.

Ammonites—Continued.

- **chicoensis** n. s. Trask. (1856.)
Proc. Cal. Acad. Nat. Sci., vol. 1, 1st. ed., p. 85, pl. 2,
figs. 1 and 1a. San Francisco, 1854-1857. J. B.
Trask.
Formation: Upper Eocene [Cretaceous].
Location: Chico creek, Cal.
- **chicoensis** (Trask) Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 68-69, pl. 13,
figs. 17, 17a, b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Chico creek, Pence's and Kelly's
ranchos, twelve miles north of Oroville, Butte
county, Siskiyou mountains, Siskiyou county;
Rancho de San Luis Gonzaga, Pacheco's pass,
Merced county, Cal.
- **colfaxii** n. s. Gabb. (1869.)
Am. Jour. Conch.; vol. 5, Phila., 1869-1870, pp. 7-8,
pl. 4, fig. 2 [and vol. 4. pl. 16.] Phila., 1870. Wm.
M. Gabb.
Formation: Jurassic.
Location: Cut of the Pacific railroad, station
2777, Sec. 53, one mile west of the town of Col-
fax; Robinson's ferry, on the Stanislaus river,
Nevada.
- **complexus** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s. pp. 394,
395, pl. 4, figs. 1a-f. Cambridge and Boston, 1855.
Hall & Meek.
Formation: Cretaceous.
Location: Great Bend of the Missouri.
- **complexus** ? (H. & M.) Gabb.
(1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 69. Phila.,
1864. W. M. Gabb.
Formation: Cretaceous.
Location: Folsom, Cal.
- **complexus** (H. & M.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr.; vol. 9, pp. 447-448, pl.
24, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great Bend of the Missouri, below Fort
Pierre.
- **complexus** var. **suciaensis** n. var.
Meek. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 317.
Phila., 1862. F. B. Meek.
Formation: Cretaceous.
Location: Sucia island, and at Komooks on Van-
couver island.
- **complexus** ? var. **suciaensis** Meek.
(1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2,
No. 4, pp. 369-370, pl. 5, figs. 2, 2a-c. Wash., 1876.
F. B. Meek.
Formation: Cretaceous.
Location: Komooks on Vancouver island, and
Sucia island.
- **complexus** var. **suciaensis** (Meek)
Whiteaves. (1879.)
Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, pp. 106-108.
Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands; Northwest bay, Van-
couver island; Trent river, Vancouver island.

Ammonites—Continued.

- **conradi** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 39-40, pl. 16,
figs. 1-3: pl. 19, fig. 4. Phila., 1834. S. G. Mor-
ton.
Formation: Cretaceous.
Location: Prairie Bluff, Alabama.
- **conradi** Morton. (1841.)
Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-
1842, p. 210. Phila., 1839-1842. S. G. Morton.
Formation: Cretaceous.
Location: Great Bend of the Missouri river, Lat.
43° 40' N.
- ? **cooperii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 69-70, pl. 44,
figs. 23, 23a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Shaft west side of Point Loma, opposite
La Playa, San Diego, Cal.
- **cordiformis** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 57.
Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Southwest base of Black hills.
- **cordiformis** M. & H. (1865.)
Paleont. upper Missouri, Smithsonian. Cont. Knowl.,
vol. 14, No. 172, pp. 122-123, pl. 5, figs. 2a-e.
Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **cordiformis** (M. & H.) Whitfield.
(1880.)
Rep. Geol. Black Hills of Dakota, pp. 378-380, pl.
6, figs. 20-24. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Redwater valley; also, on the tops of the
highest hills two miles south of the Belle
Fourche river, near Bear Lodge butte, Black
hills.
- **cordiformis** var. **distans**. Whitfield.
(1880.)
Rep. Geol. Black hills of Dakota, pp. 380-381, pl.
6, fig. 25. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Two miles south of the Belle Fourche
river, near Bear Lodge butte, Black hills.
- **crenocostatus** n. s. ? Whiteaves.
(1876.)
Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, pp. 45-47,
pl. 9, figs. 2, 2a. Montreal, 1876. J. F. Whit-
eaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
(Whiteaves calls this a provisional name.)
- **delawarensis** n. s. Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, p. 244, pl. 2, fig. 4.
New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: Chesapeake and Delaware canal.
- **delawarensis** Morton. (1830.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, p. 194. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Deep Cut of the Chesapeake and Dela-
ware canal.

Ammonites—Continued.**—delawarensis Morton. (1834.)**

Synop. Org. Rem. Cret. Gr. U. S., pp. 37-38, pl. 2, fig. 5. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal, Alabama.

—dentato-carinatus n. s. Roemer. (1849.)

Texas, pp. 417-418. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

—dentato-carinatus Roemer. (1852.)

Die Kreidebildungen von Texas, pp. 33-34, Taf. 1, figs. 2a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

—doroschini n. s. Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. aleutischen Inseln, pp. 138-142, Taf. 7, fig. 6; Taf. 8, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Chasik island, Tukusitun bay, Alaska.

—dutempleanus (d'Orb.) Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. aleutischen Inseln, pp. 142-143, Taf. 7, figs. 3, 4. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kenai bay, Alaska.

—filicinotus n. s. Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, pp. 43-45, pl. 2, figs. 2a-c and 3. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

—flaccidicosta n. s. Roemer. (1852.)

Kreide von Texas, p. 33, Taf. 1, figs. 1, a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

—fraternus n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 137-138, pl. 23, figs. 15, a, b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Benicia, Cal.

—galpini n. s. E. & S. (1857.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 42. St. Louis, 1856-1860. Evans & Shumard.

Formation: Cretaceous.

Location: On the Cheyenne river, 100 miles above its mouth.

—gardeni (Baily) Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, p. 102. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bradley creek; bank of the Trent river; ten miles up the Nanaimo river, Vancouver island.

Ammonites—Continued.**—geniculatus n. s. Conrad. 1857.)**

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 159, pl. 15, figs. 2a, b. Wash., 1859. T. A. Conrad.

Formation: Cretaceous.

Location: Bed of Rio San Pedro and Leon Springs.

—gibbonianus (Lea) Marcou. (1858.)

Geol. N. Am., p. 35, pl. 2, figs. 2a, b. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Bed of the Elm fork, one of the affluents of Trinity river, Texas.

—graysonensis n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 593-594. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Fannin county, near Lowell's bluff, and Grayson county, four miles north of Sherman, Texas.

—graysonensis (Shumard) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, p. 39, pl. 18, figs. 9a, b. Wash., 1883. C. A. White.

—guadalupe n. s. Roemer. (1849.)

Texas, pp. 416-417. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

—guadalupe Roemer. (1852.)

Kreide von Texas, p. 32, figs. 1, a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

—guadalupe (Roem.) Gabb. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 264, pl. 9, fig. 1, pl. 10, figs. 1, 1a. Phila., 1872. Wm. M. Gabb.

Formation: Cretaceous.

Location: Nugal, near the center of the state of Chihuahua, Mexico.

—halli n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 70-71. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above the mouth and one hundred and fifty miles above Milk river, Nebraska.

—haydenii n. s. Gabb. (1864.)

Geol. Surv. Cal., Paleont., vol. 1, pp. 62-63, pl. 10, figs. 8, 8a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Shasta county, Cal. (Div. A.)

—henryi n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, pp. 57-58. Phila., 1859. Meek & Hayden.

Formation: Cretaceous.

Location: Southwest part of Black hills.

Ammonites—Continued.

- **henryi** M. & H. (1865.)
Paleont. upper Missouri. Smithson. Cont. Knowl., vol. 14, No. 172, pp. 123-124, pl. 5, figs. 9a-c. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **hippocrepis** n. s. DeKay. (1827.)
Ann. New York Lyceum Nat. Hist., vol. 2, pp. 273-277, pl. 5, fig. 2 [5]. New York, 1828. J. E. DeKay.
Formation: Cretaceous.
Location: Delaware and Chesapeake canal.
- **hippocrepis** (DeKay) Morton. (1828.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 88-89, pl. 5, fig. 4. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
- **hippocrepis** (DeKay) Morton.
Am. Jour. Sci., 1st. ser., vol. 17, p. 280. New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand. [Cretaceous].
Location: Deep cut of the Chesapeake and Delaware Canal.
- **hoffmannii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 65, pl. 11, figs. 13, 13a, pl. 12, 13b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Horsetown, Shasta county, Cal. (Div. A.)
- **hoffmannii** Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 131, 132, pl. 20, figs. 8, a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, Cal.
- **homfrayi** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 26, pl. 4, figs. 18, 19. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: E. Range, Humboldt, Nevada.
- **inæquiplicatus** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 591. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Garnet's Bluff, on Red river, Fannin county, Texas.
- **indra** (Forbes) Whiteaves. (1879.)
Geol. Sur. Can.; Mes. Foss., vol. 1, part 2, pp. 105, 106, pl. 13, figs. 2, 2a. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: North west side of Hornsby island.
- **inflatus** (Sow.) Ramirez. (1880.)
An. Min. Fomento Rep. Mex., tomo 3, p. 657, lam. 1, fig. 6. Mexico, 1880. S. Ramirez.
Formation: Cretaceous.
Location: Sierra Mojada, Mexico.

Ammonites—Continued.

- **ishmæ** (Keys.) Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln., pp. 146-149, Taf. 8, figs. 4, 5, Taf. 9, fig. 5, Taf. 10, figs. 3-7. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaskan peninsula.
- **james-danæ** Barcena. (1878.)
An. Museo Nac. Mex., tomo 1, pp. 285-286, figs. 27-30. Mexico, 1877-1879. M. Barcena.
Formation: Jurassic.
Location: Acaxochitlan, Ferreria de la Trinidad, and abra de Huilacapixtla, state of Pueblo, Mexico. Published in 1874 under the name *Amm. danæ* "Datos para el estudio de los rocas mesozoicas de Mexico." Not seen.
- **jugalis** n. s. Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 133-134, pl. 22, figs. 12, a, b, 13a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez and Benicia coal mines, near Clayton, Cal.
- **jukesii?** (Sharpe) Whiteaves. (1879.)
Geol. Sur. Can.; Mes. Foss. vol. 1, part 1, pp. 111, 112, pl. 13, figs. 3, 3a, b. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Norris Rock, a small island about a mile S. 60° E. from Norman point, which is the most southerly part of Hornby island.
- **laperousianus** n. s. Whiteaves. (1876.)
Geol. Sur. Can.; Mes. Foss., vol. 1, part 1, pp. 39-41, pl. 3, fig. 3. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **lenticularis** n. s. Owen. (1852.)
Rep. Geol. Sur. Wis., Iowa, Minn., p. 579, pl. 8, fig. 5. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Fox hills, Nebraska.
- **leonensis** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, part 2, p. 160, pl. 16, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Texas.
- **? lineatus** n. s. Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 139-140, pl. 23, figs. 18a-c. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, near Folsom, from Rocky corral, Cal.
- **lœvianus** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, part 1, pp. 201-202, pl. 19, figs. 1a, b. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Ojo de los Cuervas, New Mexico.

Ammonites—Continued.**—loganianus n. s. Whiteaves. (1876.)**

Geol. Sur. Can.; Mes. Foss. vol. 1, pt. 1, pp. 27-29, pl. 8, fig. 2, fig. 3, p. 28. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

—loganianus (?) form A. Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss. vol. 1, pt. 1, pp. 29, 30, pl. 4, figs. 2, 2a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

—loganianus (?) form B. Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss. vol. 1, part 1, pp. 30-32, pl. 8, figs. 1, 1a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

—maclurei n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 48, pl. 7, figs. 2, 3. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia island.

—mandanensis n. s. Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 208, pl. 10, fig. 2. Phila., 1839-1842. S. G. Morton.

Formation: Cretaceous.

Location: Great Bend of the Missouri river (Lat. 43° 40' N.)

—mandanensis. Morton. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843, p. 107. Phila., 1843. S. G. Morton.

Formation: Cretaceous.

Location: Upper Missouri.

—marciana n. s. Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, p. 209, pl. 4, fig. 5. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Cross Timbers, Texas.

—mcclintocki n. s. Haughton. (1856.)

Jour. Roy. Dublin Soc., vol. 1, No. 4, pp. 244-245, pl. 9, figs. 2-4. Dublin, 1858. S. Haughton.

Formation: Jurassic.

Location: Point Wilkie, Prince Patrick's land.

—mcclintocki. Haughton. (1859.)

The voyage of the *Fox* in the Arctic Seas, p. 392. McClintock, London, 1859. App. B., S. Haughton.

Formation: Lias [Jurassic.]

Location: Wilkie point, Prince Patrick's land (Lat. 76° 20' N.; long. 117° 20' W.).

—meekianus n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 592, 593. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Near Post Oak creek, Grayson county, Texas.

Ammonites—Continued.**—milletianus (d'Orb.) Eichwald (1871.)**

Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln., pp. 145-146, Taf. 9, figs. 3, 4. St Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula.

—moreauensis n. s. Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., p. 579, pl. 8, fig. 7. Phila., 1852. D. D. Owen.

Formation: Cretaceous.

Location: Fox hills of Nebraska.

—mullanus n. s. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, pp. 23-25. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the upper Missouri.

—? mullanus (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 607-609, pl. 8, figs. 1a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the upper Missouri.

—nebrascensis n. s. Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., pp. 577-578, pl. 8, figs. 3, 3a, pl. 8a, fig. 2. Phila., 1852. D. D. Owen.

Formation: Cretaceous.

Location: Fox hills, Nebraska.

—nebrascensis ? Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., p. 578, pl. 8, fig. 2. Phila., 1852. D. D. Owen.

Formation: Cretaceous.

Location: Fox hills, Nebraska.

—nebrascensis (Owen) Marcou. (1853.)

Geol. map of the U. S. and Brit. Prov. of N. A., p. 46, pl. 7, fig. 4. Boston, 1853. Jules Marcou.

Formation: Cretaceous.

Location: A little north of Fort Pierre, Nebraska.

—nevadanus n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 6, 7, pl. 3, figs. 1, 1a [and vol. 4, pl. 16]. Phila., 1870. Wm. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nevada.

—nevadensis (Gabb) Meek. (1870.)

Proc. Am. Philos. Soc., vol. xi, 1869, 1870, p. 428. Phila., 1871. F. B. Meek.

Formation: Jurassic.

Location: Between Sacramento and Summit station, Cal.

—newberryanus n. s. Meek. (1858.)

Trans. Albany Inst., vol. 4, pp. 47-48. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

Ammonites—Continued.

- **newberryanus** (Meek) Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 61-62, pl. 10, figs. 5, 6, 6a, b, pl. 27, fig. 199a-c. Phila.; 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Comax ("Koomooks" of Meek), Vancouver island; north fork of Cottonwood creek, Shasta county; Martinez and Clayton, and south of Mount Diablo, Contra Costa county, Cal., Vancouver island.
- **newberryanus** Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 367-368, pl. 4, figs. 3, 3a, 3b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Sucia island.
- **newberryanus** (Meek) Whiteaves. (1879.)
Geol. Sur. Can.; Mes. Foss. vol. 1, pt. 2, pp. 109-111, pl. 14, figs. 1, 1a. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island; Browns river; lower part of the Trent river; southwest side of Denman island; Northwest bay, V. I.; Sucia islands.
- **newberryanus** (Meek) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 48. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia island.
- **nicolletii** n. s. Morton. (1841.)
Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser. 1839-1842, p. 209, pl. 10, fig. 3. Phila., 1839-1842. S. G. Morton.
Formation: Cretaceous.
Location: Great Bend of the Missouri river (Lat. 43° 40' N.).
- **novi-mexicani** n. s. Marcou. (1858.)
Geol. N. Am., pp. 35-36, pl. 1, figs. 2, 2a. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Not far from Albuquerque, and also Las Lunas, New Mexico.
- **opalus** n. s. Owen. (1852.)
Rep. Geol. Sur. Wis., Iowa, Minn., p. 579, pl. 8, fig. 6. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Great Bend of the Missouri.
- **pedernalis** (v. Buch) Roemer. (1849.)
Texas, p. 418. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Texas.
- **pedernalis** (v. Buch) Roemer. (1852.)
Kreide von Texas, p. 34, Taf. 1, figs. 3a-c. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Texas.

Ammonites—Continued.

- **pedernalis** (v. Buch) Gabb. (1869.)
Geol. Surv. Cal., Paleont., vol. 2, pp. 258-259, pl. 35, figs. 1, 1a. Phila., 1869. Wm. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **percarinatus** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 396, pl. 4, figs. 2a-c. Cambridge and Boston, 1853. Hall & Meek.
Formation: Cretaceous.
Location: Missouri river, five miles below the mouth of the Vermilion.
- **percarinatus** (H. & M.) Newberry. (1861.)
Rep. Colorado river of the West. Part 3, pp. 117, 118, Wash., 1861. J. S. Newberry.
Formation: Cretaceous.
- **percostatus** Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 138-139, pl. 24, fig. 19. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: California.
- **perezianus** n. s. Whiteaves. (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 19-21, pl. 2, figs. 1, 1a. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **peruvianus** (de Buch) Marcou. (1858.)
Geol. N. Am., pp. 34-35, pl. 5, figs. 1, 1a, b. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Bed of Elm Form river, an affluent of Trinity river, Texas.
- **peruvianus** (de Buch?) Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 63, pl. 10, fig. 9. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan Springs, Tehama county, Cal.
- **pierdenalis** n. s. von Buch. (1848.)
Abhandl. Akad. der Wissenschaften, p. 30a, pl. 6, figs. 8, 9, 10, 1848, Berlin, 1850.
Formation: Cretaceous.
Location: Pedernales river, Texas.
- **placenta** n. s. DeKay. (1827.)
Ann. New York Lyceum Nat. Hist., vol. 2, p. 278, pl. 5, fig. 3 [2]. New York, 1828. J. E. DeKay.
Formation: Cretaceous.
Location: Delaware and Chesapeake canal.
- **placenta** (DeKay) Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, pp. 279-280. New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: Deep cut of the Chesapeake and Delaware canal.
- **placenta** (DeKay) Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, pl. 2, figs. 1-3. New Haven, 1830. S. G. Morton.

Ammonites—Continued.

- **placenta** (DeKay) Morton. (1830.)
 Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 195-196, pl. 5, fig. 4. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
- **placenta** (DeKay) Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., pp. 36-37, pl. 2, figs. 1, 2. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Deep cut of the Chesapeake and Delaware canal, New Jersey; southern bend of the Tennessee river.
- **placenta** (De Kay) Morton. (1841.)
 Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 210. Phila., 1839-1842. S. G. Morton.
 Formation: Cretaceous.
 Location: Great Bend of the Missouri. (Lat. 43° 40' N.)
- **placenta** (De Kay) Meek. (1859.)
 N. W. Terr.; Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind, p. 184, Toronto, 1859. F. B. Meek.
 Formation: Cretaceous.
 Location: South branch of the Saskatchewan, Canada.
- **placenta** (De Kay) Meek. (1870.)
 Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.
 Formation: Cretaceous.
 Location: Fountain creek, Colorado city, Colorado.
- **placenta** (De Kay) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 278. Phila., 1876. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Pataula creek, Georgia.
- **placenta var. intercalaris**, n. var. M. & H. (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, p. 177. Phila., 1861. Meek & Hayden.
 Formation: Cretaceous.
 Location: Cheyenne river, Nebraska.
- **planicosta** (Sow.) Ramirez. (1880.)
 An. Min. Fomento Rep. Mex., tomo 3, p. 657. lam. 1, fig. 7. Mexico, 1880. S. Ramirez.
 Formation: Cretaceous[?]
 Location: Sierra Mojada, Mexico.
- **pleurisepta** n. s. Conrad. (1854.)
 Rep. U. S. & Mex. Bound. Sur., vol. 1, pt. 2, p. 159, pl. 15, figs. 1a-c. Wash., 1857. T. A. Conrad.
 Formation: Cretaceous.
 Location: *Jacun, 3 miles below Laredo.*
 [This region is now known to be occupied by Eocene rocks, therefore the locality as above given by Mr. Conrad is evidently a mistake].
- **ramosus** (Meek) Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, p. 65, pl. 11, figs. 12, 12a, pl. 12, fig. 12b. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Cottonwood creek, Shasta county, Cal.

Ammonites—Continued.

- **ramsaueri** (Quenst.) Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, p. 27, pl. 3, figs. 21, 21a. Phila., 1864. W. M. Gabb.
 Formation: Triassic.
 Location: Gifford's ranch, Plumas county, Cal.
- **rémondii** n. s. Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, pp. 66-67, pl. 12, figs. 14, 14a, 15. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: North fork of Cottonwood creek, Shasta county, Cal. (Div. A).
- **richardsonii** n. s. Whiteaves. (1876.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 32, 33, pl. 5. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte island.
- **riorii** n. s. N. & G. (1840.)
 Bull. Roy. Acad. Sci., Bruxelles, tome 7, pt. 2, pp. 217-218, fig. 8. Bruxelles, 1840. Nyst & Galeotti.
 Formation: Jurassic.
 Location: Tehuacan, Mexico.
- **selwynianus** n. s. Whiteaves. (1879.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 104-105, pl. 13, figs. 1, 1a. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Sucia islands.
- **serrato-carinatus** n. s. Meek. (1870.)
 Proc. Am. Philos. Soc., vol. 11, 1869, 1870, pp. 429-430. Phila., 1871. F. B. Meek.
 Formation: Cretaceous.
 Location: Medicine Bow river.
- **shumardi** n. s. Marcou. (1858.)
 Geol. N. Am., pp. 33-34, pl. 1, figs. 1, 1a. Zurich, 1858. Jules Marcou.
 Formation: Cretaceous.
 Location: Borders of Red river, near Preston, Texas.
- **skidegatensis** n. s. Whiteaves. (1876.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 34-37, pl. 7, pl. 9, fig. 1, fig. 4, p. 34. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte island.
- **stoliczkanus** n. s. Gabb. (1869.)
 Geol. Sur. Cal., Paleont., vol. 2, pp. 135, 136, pl. 23, figs. 16, a. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Cottonwood creek, Shasta county, Cal.
- **stoliczkanus var. spiniferus** n. var. Whiteaves. (1876.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 24, 27, pl. 3, fig. 3; pl. 4, figs. 1, 2, p. 24. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte island.

Ammonites—Continued.**— subtricarinatus (d'Orb.) Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, pp. 60-61, pl. 10, figs. 4, 4a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Vicinity of Battle creek, Tehama county, Cal.

— suciaensis (Meek) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 133. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near Monte Diablo, Cal.

— swallowii n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 591-592. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Grayson county, four and a half miles north of Sherman, and bluffs of Red river, in Fannin and Lamar counties, Texas.

— swallowii (Shumard) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 39, pl. 18, fig. 1a. Wash., 1883. C. A. White.

— syrtalis n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 40, pl. 14 [16], fig. 4. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Greene county, Alabama.

— tehamaensis n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 132, 133. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— telifer n. s. Morton. (1833.)

Am. Jour. Sci., 1st. ser., vol. 23, p. 290. New Haven, 1833. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: Delaware.

— telifer Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 38, pl. 2, fig. 7. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

— texanus n. s. Roemer. (1849.)

Texas, p. 417. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels and Austin, Tex.

— texanus Roemer. (1852.)

Kreide. von Texas, pp. 31-32, Taf. 3, figs. 1, a-e. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Austin and at waterfall of the Guadalupe below New Braunfels, Texas.

— texanus n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 159-160, pl. 16, figs. 1a-d. Wash., 1859. T. A. Conrad.

Formation: Cretaceous.

Location: Near Puercos river.

Ammonites—Continued.**— timotheanus (Mayor) Whiteaves. (1876.)**

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 41, 42, pl. 3, figs. 2, 2a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— traskii n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 63-64, pl. 11, fig. 11, pl. 12, fig. 11. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Arbuckle's diggings, Shasta county, Cal. (Div. A).

— traskii Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 131, pl. 19, figs. 7a, b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— trinitensis n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 278. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Texas.

— turneri n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, pp. 26-27, pl. 5, figs. 1 and 2. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Curry's Cañada, south of Mount Diablo, Cal.

— vancouverensis n. s. Meek. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 317, 318. Phila., 1862. F. B. Meek.

Formation: Cretaceous.

Location: Komooks, eastern shore of Vancouver island.

— vancouverensis (Meek) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 103. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— vanuxemi n. s. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 244, pl. 3, figs. 3, 4. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: Chesapeake and Delaware canal.

— vanuxemi Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 194, 195. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal.

— vanuxemi Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 38, pl. 2, figs. 3, 4. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal.

Ammonites—Continued.**— valledæ (Michelin) Whiteaves. (1879.)**

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 103, 104. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— vermillionensis n. s. M. & H. (1860).

Proc. Acad. Nat. Sci., Phila., for 1860, p. 177. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Vermilion river, Nebraska.

— vespertinus n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 40-41, pl. 17, fig. 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Plains of Kiamesha, Arkansas.

— vespertinus (Mort.) Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, p. 209. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Near Fort Washita, Indian Territory.

— walcotti n. s. Hill. (1888.)

Ann. Rep. Geol. Sur. Arkansas, for 1888, vol. 2, pp. 128-129, pl. 1, figs. 1, 1a, 1b. Little Rock, 1888. R. T. Hill.

Formation: Cretaceous (?).

Location: Mouth of Caney creek, branch of Prairie creek, near Murfreesboro, Pike county, Arkansas.

— whitneyi n. s. Gabb. (1869.)

Geol. Surv. Cal., Paleont., vol. 2, pp. 134-135, pl. 22, figs. 14a, b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

— wosnessenskii n. s. Grewingk. (1850.)

Verhand. der Russisch-Kaiserlichen Mineral Gesells., pp. 344-346, pl. 4, fig. 1a-d. St. Petersburg, 1850. C. Grewingk.

Formation: Jurassic.

Location: Katmai bay, south coast of Alaska peninsula.

— (Amaltheus) Whiteavesii n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, pp. 69-90, pl. 13, figs. 1-5. Wash., 1889. C. A. White.

Formation: Jurassic.

Location: Kialagvic bay, Alaska.

— (Lillia) howelli n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, pp. 68-69, pl. 12, figs. 1 and 2, pl. 14, figs. 1-3. Wash., 1889. C. A. White.

Formation: Jurassic.

Location: Kialagvic bay, Alaska.

— (Lillia) kialagvikensis n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 69, pl. 13, fig. 7. Wash., 1889. C. A. White.

Formation: Jurassic.

Location: Shores of Kialagvic bay, Alaska.

Ammonites—Continued.**— (Scaphites ?) ramosus n. s. Meek. (1858.)**

Trans. Albany Inst., vol. 4, pp. 45-47. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— sp. A. Whiteaves. (1874.)

Geol. Sur. Can. Rep. Prog. for 1873-1874, p. 261. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— sp. B. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 261. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— sp. C. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 261. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— (Brug.) Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 44. New Haven, 1820. Thomas Say.

Formation: Alluvium [Cretaceous].

Location: New Jersey.

— ? DeKay. (1827.)

Ann. New York Lyceum Nat. His., vol. 2, p. 278, pl. 5, figs. 4 and 5 [3 and 4]. New York, 1828. J. E. DeKay.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal.

— sp. undet. Roemer. (1849.)

Texas, p. 418. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Texas.

— sp. undet. Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, p. 210, pl. 6, fig. 4. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Cross Timbers, Texas.

— sp. undet. Meek. (1859.)

N. W. Terr., Rep. Prog. Assin. and Saskat., Expl. Exped. H. Y. Hind, p. 184. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: Two Creeks, Canada.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Fountain creek, Colorado city, Colo.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Mission station, N. P. R. R.

Ammonites—Continued.— *sp. undet. Toula.* (1874.)

Die Zweite Dutsche Nordpolarfahrt, Zweiter Band, p. 500. Leipzig, 1874. Franz Toula.
Formation: Jurassic. [Cretaceous?].
Location: Kuhn island, east coast of Greenland.

— *sp. undet. Whiteaves.* (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 262. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, 10 miles up.

— *sp. undet. Whiteaves.* (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 264. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Below Dodd Narrows.

— *sp. undet. Whiteaves.* (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, p. 47, pl. 3, figs. 4, 4a. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.

— *sp. undet. Hill.* (1889.)

Geol. Sur. Texas, Bull. No. 4, p. 22. Austin, 1889. R. T. Hill.
Formation: Cretaceous.
Location: Cow creek beds, near Travis Peak, Texas.

— *Schiel.* (1854.)

Rep. Expl. and Sur. R. R. R. Mississippi river to Pacific ocean, vol. 2; Rep. Expl. 41st parallel, N. Lat., p. 109, pl. 3, fig. 13. Wash., 1855. James Schiel.
Formation: Cretaceous.
Location: Grand river.

— *White.* (1878.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 186. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Little Thompson creek, Colorado.

Ampullina (?) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 161. Phila., 1869. W. M. Gabb.

— *striata n. s. Gabb.* (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 161-162, pl. 27, fig. 40. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.

Amusium conradin. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 52-53, pl. 7, figs. 8-10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, New Jersey.

— *lenticulare nom. prov. Whiteaves.* (1884.)

Geol. & Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 242-243, pl. 32, fig. 5. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: North shore of Cumshewa inlet.

Amusium—Continued.— *simplicum* (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 51-52, pl. 7, figs. 11, 12. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Monmouth county, New Jersey.

Amussium (Klein). Meek. (1865.)

Geol. Sur. Cal., Geology, vol. 1, p. 478. Phila., 1865. F. B. Meek.

— *aurarium n. s. Meek.* (1865.)

Geol. Sur. Cal., Geology, vol. 1, pp. 478-479, pl. 1, figs. 6, 6a. Phila., 1865. F. B. Meek.
Formation: Jurassic [Cretaceous?]
Location: Mariposa estate, California.

Anadema sub. gen. (H. & A. Adams)
White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 17. Wash., 1889. C. A. White.

Ananchytes (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245. New Haven, 1830. S. G. Morton.

— *cinctus* Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 7. New Haven, 1830. S. G. Morton.

— *cinctus* Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 200. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.

— *cinctus* Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 78. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.

— *cruciferus n. s. Morton.* (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245, pl. 3, fig. 8. New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: New Jersey.

— *cruciferus* Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 201. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.

— *fimbriatus n. s. Morton.* (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pp. 245-246, pl. 3, fig. 9. New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: New Jersey.

— *fimbriatus* Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 200-211. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.

— *fimbriatus* Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 78-79, pl. 3, fig. 20. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.

Ananchytes—Continued.— *sp. undet.* Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous.]

Location: United States.

Anatimya n. sub gen. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 276. Phila., 1858-1860. T. A. Conrad.

Anatina (Lam.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 324. Phila., 1862. Wm. M. Gabb.

— *elegans n. s.* Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln., pp. 119-121. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak and Unalaska islands, Alaska.

— *elliptica n. s.* Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila. for 1862, p. 224. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Location: Mullica hill, New Jersey.

— *inequilateralis n. s.* Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 151, pl. 29, fig. 241. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North side of Siskiyou mountains, Oregon, near the stage road.

— ? *lata n. s.* Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 151, pl. 22, fig. 126. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's Ranch, Butte county, Cal.

— *quadrata n. s.* Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 177, pl. 29, fig. 64. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: North shore of Departure bay, Nanaimo, Vancouver island.

— *sulcatina n. s.* Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, pp. 204, 205. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Chatfield point, Navarro county, Texas.

— *sulcatina* (Shumard) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss. vol. 1, pt. 2, pp. 139, 140, pl. 17, figs. 5, 5a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— *sulcatina* (Shumard?) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 43-44, pl. 6, fig. 1. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia island.

— *tryoniana n. s.* Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 150-151, pl. 29, fig. 240. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Anatina—Continued.— *tryoniana* (?) (Gabb) Whiteaves. (1874.)

Geol. Sur. Can.; Rep. Prog. for 1873-1874, p. 265. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

— *tryoniana* (Gabb) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss. vol. 1, pt. 2, p. 140. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

— ? *sp. undet.* Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two and one-fourth and two and one-half miles up.

Anchistoma parvulum n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 19-20, pl. 3, figs. 2, 2a, b. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Old Man river, two miles above Ryegrassflat, Canada.

Anchura n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.

— (Conrad typical.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 324. Wash., 1876. F. B. Meek.

— *abrupta n. s.* Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 284-285, pl. 47, fig. 1. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Mississippi.

— *abrupta* (Conrad) Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 145, pl. 14, fig. 13. Phila., 1868. Wm. M. Gabb.

Formation: Cretaceous.

— *americana* (E. & S. sp.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 185. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Little Thompson creek, Colorado.

— *americana* (E. & S. sp.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 48-49. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South branch of the Saskatchewan; Ross creek, near Irvine station, on the Canadian Pacific railway; Old Wives creek, township 10, range 11, west of 3rd principal meridian; North Woody mountain, on a branch of Old Wives creek, in township 6, range 4, west of the same meridian, Canada.

Anchura—Continued.**—arenarum (Morton sp.) Gabb. (1876.)**

Proc. Acad. Nat. Sci., Phila., for 1876, p. 298.

Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia.

—bella n. s. Conrad. (1874.)

Seventh Ann. Rep. U. S. Geol. and Geogr. Sur.

Terr., p. 455. Wash., 1874. T. A. Conrad.

Formation: Cretaceous.

Location: [Near Denver and in the South Park, Colorado.]

—? carinifera n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 166, pl. 28, fig. 46. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

—exilis (Gabb) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, part 2, p. 123.

Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

—falciformis Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 145, pl. 14, fig. 14.

Phila., 1868. Wm. M. Gabb.

Formation: Cretaceous.

—falciformis. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 165. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Chico creek, Cal.

—? fusiformis (Meek MSS.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, part 1, pp. 190-191, pl. 18, fig. 4a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: East bank of Rio Puerco, six miles below Casa Salazan; six miles west of Seboetto; and Cerro Rotunda, New Mexico.

—? fusiformis n. s. Meek. (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, part 1, pp. 160-161, pl. 15, figs. 2, 2a. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Water tank two miles from Coalville, Utah, and on Chalk creek above Coalville.

—fusiformis (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

—haydeni n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.

Terr., p. 185. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Fossil ridge, Colorado.

Anchura—Continued.**—haydeni White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.

Terr., pp. 311, 312, pl. 7, fig. 1a. Wash., 1879.

C. A. White.

Formation: Cretaceous.

Location: Fifteen miles west of Greeley, Colo., and about six miles south of Fort Collins.

—monilifera n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 262, pl. 35, fig. 7. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de los Conchas, near Arivechi, Sonora, Mexico.

—? newberryi n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, New Mexico, to junction of Grand and Green rivers, pp. 129-130, pl. 2, fig. 5. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Rio de la Plata.

—nuptialis n. s. White. (1874.)

Prelim. Rep. Invert. Foss.; Geogr. and Geol. Expl. and Sur. west of 100th Meridian, p. 24.

Wash., 1874. C. A. White.

Formation: Jurassic? Cretaceous.

Location: Fifty miles north of Camp Apache, and five miles west of Mineral Spring, Arizona.

—? parva (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 328, pl. 19, figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

—prolabiata n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 121-122. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab and Sink Spring, Utah.

—rostrata (Mort.) Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 12, pl. 2, fig. 28. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Inadvertently called *A. rostrata*. Should be *A. pennata*. See Proc. Acad. Nat. Sci., Phila., for 1876, p. 275. Phila., 1876.

—ruida n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 120-121. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, Utah.

—stenoptera (Goldf. sp.) Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, p. 123, pl. 15, figs. 11, 11a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, two miles and a quarter up, Vancouver island.

Anchura—Continued.— ? *sublevis*. (M. & H.) Meek (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 327-328, pl. 19, figs. 3a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

— ? *sublevis* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, p. 428. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Near Box-elder creek, Black hills, Dakota.

— *texana* (Roem. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 298, 299. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

— *transversa* n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 165, pl. 27, fig. 45. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— (*Drepanocheilus*) *americana* Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur. Smithsonian. Misc. Coll., vol. 7, No. 177, pp. 35-36. Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Idaho.

— (*Drepanocheilus*) *americana*. (E. & S. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 325-326, pl. 32, figs. 8a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Long lake, and other localities; Yellowstone river.

— (*Drepanocheilus*) *mudgeana* n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 312-313, pl. 7, figs. 3a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Denison, Texas.

— (*Drepanocheilus*) *nebrascensis*. (E. & S. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 326-327, pl. 19, figs. 5a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Crow creek, near Black hills; also on Sage creek, near the Bad Lands of White river.

— (*Drepanocheilus*) *nebrascensis* (E. & S.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, p. 429, pl. 12, figs. 2, 3. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek, three miles west of Camp Jenney, Black hills.

— (*Drepanocheilus*) *prolabiata* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 313-314, pl. 7, fig. 2a. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab and Sink Spring, Utah.

Anchura—Continued.— (*Drepanocheilus*) *ruida* White (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 312, pl. 7, figs. 4, a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, southern Utah.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. XI, 1869, 1870, p. 430.

Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Dodson's ranch.

— ? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 229-230. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Dodd's ranch on Ashley's fork, Utah

Ancillaria (Lam.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 100. Phila., 1864. W. M. Gabb.

— *elongata* n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 100, pl. 18, fig. 54.

Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near San Diego, east of Mount Diablo, and Clayton, Cal.

Ancyloceras (d'Orb.) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 266.

Phila., 1856. T. A. Conrad.

— *approximans* n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 266.

Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Arkansas.

— *annulatum* (Shumard) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.

Terr., Part 1, p. 39, pl. 18, figs. 10a, b. Wash.,

1883. C. A. White.

— *annulatus* n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 595.

St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Shawnee creek, Grayson county, Texas.

— ? *cheyennensis* n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 71, 72.

Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth Cheyenne river, Nebraska.

— *jenneyi* n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky mountain region: Prelim. Rep., Paleont., Black hills, pp. 42-43. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek, three miles west of Camp Jenney, Black hills.

Ancyloceras—Continued.— **jenneyi** (Whitfield) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 452-454, pl. 16, figs. 7-9. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek, three miles west of Camp Jenney, Black hills.

— **jenneyi** (Whitfield?) Stanton. (1887.)

Proc. Colorado Sci. Soc., vol. 2, pt. 3, for 1887, p. 187. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colorado.

— **mortoni** (H. & M. sp.) H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, p. 411. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

— **? nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 71. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Iguor creek, north fork, Cheyenne, Nebraska.

— **? nicolletii** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 397-398, pl. 4, fig. 4. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Great Bend of the Missouri.

— **percostatus** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 138-139, pl. 24, fig. 19. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— **percostatus** (Gabb) Whiteaves. (1882.)

Proc. and Trans. Roy. Soc. Canada, vol. 1, sec. 4, p. 82. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: North slope of Jackass mountain, Canada.

— **rémondi** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 138, pl. 23, fig. 17. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— **rémondi** (Gabb) Whiteaves. (1882.)

Proc. and Trans. Roy. Soc. Canada, vol. 1, sec. 4, pp. 82, 83. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: West side of Fraser river, below Lytton and opposite Boston bar, north slope of Jackass mountain, Canada.

— **rémondi** (Gabb) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 212, pl. 28, figs. 2, 2a. Montreal,

Formation: Cretaceous.

Location: North Shore of Cumshura inlet.

Ancyloceras—Continued.— **tricostatus** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. region: Prelim. Rep. Paleont., Black hills, pp. 43-44, Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne, near French creek, Black hills, Dakota.

— **tricostatus** (Whitfield) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 454-455, pl. 15, figs. 7, 8. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne, near French creek, Black Hills.

— **? uncum** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 409-410, pl. 21, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: South fork of Cheyenne river, near the Black hills.

— **(Hamites) uncus** n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, pp. 56-57. Phila., 1859. Meek & Hayden.

Formation: Cretaceous.

Location: South fork of Cheyenne river, near the base of Black hills.

— **sp. undet.** Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 78-79, pl. 15, figs. 30, 30a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Arbuckle's diggings, Cal.

Angaria (Bolt.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 121. Phila., 1864. W. M. Gabb.

— **cingulata** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 264, pl. 35, fig. 9. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de los Conchas, near Arivechi, Sonora, Mexico.

— **ornatissima** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 121, pl. 20, fig. 78. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county, Tuscan Springs, Cal.

Angulus (sub. gen. Schumacher) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

Anisomyon n. g. M. & H. (1859.)

Am. Jour. Sci., 2d ser., vol. 29, pp. 33-35. New Haven, 1860. Meek & Hayden.

— **alveolus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 293, pl. 18, figs. 4, a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth.

Anisomyon—Continued.— **alveolus** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 433-434, pl. 12, fig. 20. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.

Location: On Old Woman fork of the Cheyenne river, Black hills.

— **alveolus** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can. Cont. Can., Paleont., vol. 1, pt. 1, p. 47. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: White Mud river (or Frenchman's creek) near the 49th parallel and south of Woody mountain, Canada.

— **borealis** (Mort. sp.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, pt. 1, pp. 193-194, pl. 18, figs. 9a, b. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Gallinas creek, New Mexico.

— **borealis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 288-289, pl. 18, figs. 9, a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri below Fort Pierre.

— **borealis** (Mort.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, p. 436, pl. 12, figs. 21-23. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Cheyenne river, Black hills.

— **borealis** (Morton) Stanton. (1887.)

Proc. Colorado Sci. Soc., vol. 2, pt. 3, for 1887, p. 185, [Denver, 1888]. T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colorado.

— **centrale** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 312. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Box-elder and Colorado city, Colorado.

— **centrale** (Meek) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, pt. 1, pp. 194-195, pl. 18, figs. 8a, b. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Gallinas creek, New Mexico.

— **centrale** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 225. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near White river Indian agency, Colorado.

— **centrale** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 206. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colorado.

Anisomyon—Continued.— **centrale** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 303-304, pl. 9, figs. 1a-d. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Box-elder and Colorado city, Colorado.

— **centrale** (Meek) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can. Cont. Can. Paleont., vol. 1, pt. 1, pp. 47-48, pl. 7, figs. 1, 1a, 2, 2a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Old Wives creek, township 10, range 11, west of 3d principal meridian, Canada.

— **haydeni** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 198. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Chatfield point, Navarro county, Texas.

— **meekii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 142, pl. 21, fig. 105. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Cal.

— **meekii** (Gabb?) var. Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 129-130. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Banks of Trent river, above the falls, Vancouver island.

— **patelliformis** n. s. (M. & H.) (1859.)

Am. Jour. Sci., 2d ser., vol. 29, pp. 33-35, pl. 1, figs. 1-3. New Haven, 1860. Meek & Hayden.

Formation: Cretaceous.

Location: Nebraska.

— **patelliformis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 290-291, pl. 18, figs. 5a-c, and e?. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth.

— **patelliformis** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, p. 435, pl. 12, figs. 17, 18. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman fork, Black hills.

— **sexsulcatus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 293, pl. 18 figs. 8a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and sixty miles from its mouth.

— **sexsulcatus** (M. & H.?) Meek. (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, p. 162 figs. 4, 5. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Outer sandstone ridge, southeast of La Porte, Colorado.

Anisomyon—Continued.— **shumardi** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 289-290,
pl. 18, figs. 7a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

Location: Great bend of the Missouri, below Fort
Pierre.

— **subovatus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 291-292,
pl. 18, figs. 5d and 6. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

Location: Yellowstone river, one hundred and
fifty miles above its mouth.

— **subovatus** (M. & H.) Whitfield.
(1880.)

Rep. Geol. Black hills of Dakota, pp. 434-435, pl.
12, fig. 19. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman fork.

— **sp. undet.** Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429.
Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Valley of Fountain creek, Colorado.

— **sp. undet.** Hill. (1889.)

Geol. Sur. Texas, Bull. No. 4, p. 20. Austin, 1889.
R. T. Hill.

Formation: Cretaceous.

Location: San Antonio, Texas.

Anisorhynchus (sub. gen. Con.) Meek.
(1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 241. Wash.,
1876. F. B. Meek.

Anisus (sub. gen. Fitzinger.) Meek.
(1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 536. Wash.,
1876. F. B. Meek.

Anodonta (Cuvier) White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, p. 709. Wash., 1878. C. A. White.

— **corpulentoides** n. s. Lea. (1868.)

Proc. Acad. Nat. Sci., Phila., for 1868, p. 164. Phila.,
1868. Isaac Lea.

Formation: Cretaceous.

Location: About six miles northeast of Camden,
New Jersey.

— **corpulentoides** (Lea.) Whitfield.
(1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 252, pl. 35,
fig. 1. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, New
Jersey.

— **grandioides** n. s. Lea. (1868.)

Proc. Acad. Nat. Sci., Phila., for 1868, p. 164.
Phila., 1868. Isaac Lea.

Formation: Cretaceous.

Location: About six miles northeast of Camden,
New Jersey.

Anodonta—Continued.— **grandioides** (Lea) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 8, pp. 251-252, pl.
35, figs. 2, 3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, New
Jersey.

— **parallela** n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, p. 709. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, northern Colo-
rado, about ten miles above the confluence of the
creek with South Platte river.

— **parallela** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 168. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— **parallela** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 62, pl. 24, fig. 3a. Wash., 1883.
C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, northern Colo-
rado.

— **parallela** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 23, pl. 19,
fig. 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, northern Colo-
rado.

— **parallela?** (White) Whiteaves.
(1885.)

Geol. and Nat. Hist. Sur. Can. Cont. Can. Paleont.
vol. 1, pt. 1, p. 64. Montreal, 1885. J. F. White-
aves.

Formation: Cretaceous.

Location: South Saskatchewan, one mile below
the mouth of Bow river, Canada.

— **propatoris** n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3,
No. 3, p. 601. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Dog creek, and also upon the north
side of the Missouri river, near Birch creek,
Montana.

— **propatoris** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 23, pl. 19,
figs. 6-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **propatoris** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 61-62, pl. 24, figs. 2a-d. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Dog creek, and also upon the north
side of the upper Missouri river, near Birch
creek, Montana.

Anodonta—Continued.**— propatoris? (White) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can. Cont. Can. Paleont., vol. 1, pt. 1, pp. 58-59, pl. 9, figs. 2, 2a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Forty-ninth parallel, six miles west of the first or south branch of the Milk river; Big Island bend, on the Belly river; Milk River ridge; South Saskatchewan, eight miles above the mouth of the Red Deer river; Red Deer river, township 21, range 12, west of 4th principal meridian; near Bull's Head, Canada.

Anomia (Linn.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 284. New Haven, 1830. S. G. Morton.

— andersonii n. s. M. & V. (1878.)

Proc. Acad. Nat. Sci., Phila., pt. 2, for 1878, p. 272, figs. 1 and 2. Phila., 1878. Mazyck & Vogdes.

Formation: Cretaceous.

Location: Artesian well on the Citadel Green, Charleston, S. C., between 1,880 and 1,930 feet below the surface.

— argentaria n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 5, fig. 10. New Haven, 1833. S. G. Morton.

Formation: Ferruginous sand. [Cretaceous.]

Location: New Jersey.

— argentaria Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 61, pl. 5, fig. 10. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: St. Georges, Delaware.

— argentaria (Morton) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., 1876, pp. 319, 320. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia.

— argentaria (Mort.) Whitfield. (1884.)

Mon. U. S. Geol. Sur., vol. 9, p. 42, pl. 4, figs. 9-11. Wash., 1885. R. P. Whitfield.

Location: Freehold, N. J.

— concentrica n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, pp. 311-312. Phila., 1861. F. B. Meek.

Formation: Cretaceous.

Location: Near Bear river, on Sulphur creek, lat. 41° 12', long. 110° 50'.

— concentrica Meek. (1876.)

Rep. Expl. Great Basin Terr. Utah, p. 359, pl. 4, fig. 3. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Bear river, near the mouth of Sulphur creek, Wyoming.

— ephippium? (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, pp. 284, 285. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand. [Cretaceous.]

Location: St. Georges, Del., and other places in the vicinity. Near Arneytown, N. J.

Anomia—Continued.**— flemingi n. s. Meek. (1859.)**

N. W. Terr. Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind, p. 183, pl. 1, figs. 2, 3. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: Little Souris river, Canada.

— ? gryphorhynchus n. s. Meek. (1872.)

Fifth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 375-376. Wash., 1872. F. B. Meek.

Formation: Cretaceous.

Location: Point of Rocks, Wyoming.

— gryphorhynchus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 166-167. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— gryphorhynchus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 208. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Cañon park, Colorado.

— gryphorhynchus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bitter creek valley, two miles west of Point of Rocks station, Wyoming.

— gryphorhynchus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 217. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Two miles below Point of Rocks; Crow creek; Black buttes, Wyoming; Yampa valley, near Cañon park, Colorado.

— gryphorhynchus (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 57, pl. 25, figs. 1a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Two miles below Point of Rocks, Wyoming.

— gryphorhynchus (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 16, pl. 12, figs. 12-15. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Colorado and Wyoming.

— lineata n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 203-204, pl. 26, fig. 193. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Pence's ranch, Chico creek, etc., California.

Anomia—Continued.— **linifera** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh,
1875. W. C. Kerr. App. A, p. 2, pl. 1, fig. 1.
T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **lintea** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh,
1875. W. C. Kerr. App. A, p. 2. T. A. Conrad.

Formation: Cretaceous.

Location: The Barn, Cape Fear river, North Carolina.

— **miconema** n. s. Meek. (1875.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 1,
No. 1, 2d ser. p. 43. Wash., 1875. F. B. Meek.

Formation: Cretaceous.

Location: Two hundred miles east of Denver, Colorado.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 165-166. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 190. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colorado.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 208. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Cañon park, Colorado.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 211. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colorado.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Rock Springs, Wyoming.

— **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 217. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black buttes and Rock Springs, Wyoming.

— **miconema** (Meek) White (under valve.) (1882.)

Proc. U. S. Nat. Mus., vol. 5, pp. 97-98, pl. 3,
fig. 3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Northeastern Colorado.

Anomia—Continued.— **miconema** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 57-58, pl. 25, figs. 2a-d. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: From a shaft sunk on the Kansas Pacific railroad, two hundred miles east of Denver, Colo., 45 feet below the surface.

— **miconema** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 16, pl. 12, figs.
6-11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Northeastern Colorado.

— **miconema** (Meek) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur., Can. Cont. Can.
Paleont., vol. 1, pt. 1, p. 64. Montreal, 1885.
J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, half a mile below the forks of the Bow and Belly rivers, Canada.

— **nitida** n. s. Meek. (1876.)

Rep. Expl. Exped., Santa Fé, New Mexico, to
junction of Grand and Green rivers, p. 125, pl.
1, figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Pope's Well.

— **obliqua** n. s. (M. & H.) (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 181.
Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Near mouth of Niobrara river, Nebraska.

— ? **obliqua** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 22, pl. 9,
fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the mouth of the Niobrara river, on the Missouri.

— **obliqua** (M. & H.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur., Can. Cont. Can.
Paleont., vol. 1, pt. 2, p. 187. Montreal, 1889.
J. F. Whiteaves.

Formation: Cretaceous.

Location: Vermilion river, township 24, range 20 w.; and Ochre river, township 22, range 17 w. Manitoba.

— **perstrigosa** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur., Can.; Cont. Can.
Paleont., vol. 1, pt. 1, pp. 4-5, pl. 1, fig. 2. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Upper Belly river, 23 miles above the mouth of the Waterton. St. Mary's river series, Canada.

— **propatoris** n. s. White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 14-15, pl. 12, figs. 15a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Anomia—Continued.**—propatoris White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 16, pl. 5, figs. 6, 7. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

—raetiformis n. s. Meek. (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, p. 141, fig. 1. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Ridge southeast of Laporte, Colorado territory.

—sellæformis n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser. 1855-1858, p. 330, pl. 34, fig. 6. Phila., 1855-1858.

T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

—semiglobosa (Gein.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 231-232. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Woodbury and Haddonfield, New Jersey.

—subtrigonalis n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 181. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Bijou hill, Nebraska.

—? subtrigonalis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 22-23, pl. 16, figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Bijou hill, on the Missouri.

—tellinoides n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294, pl. 5, fig. 11. New Haven, 1833. S. G. Morton.

Formation: Ferruginous sand (Cretaceous).

Location: New Jersey.

—tellinoides Morton. (1834.)

Synop. Org. Rem. Cret. Gr., U. S. p. 61, pl. 5, fig. 11, Phil., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey, etc.

—tellinoides (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 43, pl. 4, figs. 12, 13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Freehold, New Jersey.

—truncata (Gein.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 232. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Woodbury and Haddonfield, New Jersey.

—vancouverensis n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 202, pl. 33, fig. 102. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Departure bay, near Nanaimo, Vancouver island.

Anomia—Continued.**—vancouverensis (Gabb) Whiteaves. (1879.)**

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 175-177, pl. 20, figs. 5, 5a-d. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Banks of the Trent river, Vancouver island, above the falls.

—vancouverensis (Gabb) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 36. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Waldron island.

—(Placunopsis?) gryphorhynchus Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 509-511. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Two miles below Point of Rocks, Wyoming.

—? White. (1878.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

—sp. undet. Hill. (1888.)

Ann. Rep. Geol. Sur. Arkansas for 1888, vol. 2, p. 135. Little Rock, 1888. R. T. Hill.

Formation: Cretaceous?

Location: Arkansas.

Anthonya n. g. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 181-182. Phila., 1864. W. M. Gabb.

—cultriformis n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 182, pl. 30, figs. 236, 236a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

Anthophyllum (Schweigg.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.

—atlanticum n. s. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand (Cretaceous).

Location: Gloucester county, New Jersey.

—atlanticum Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 1, figs. 9, 10. New Haven, 1830. S. G. Morton.

—atlanticum Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 80, pl. 1, figs. 9, 10. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Gloucester county, New Jersey.

—Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 123-124. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Aphrodina n. g. Conrad. (1868.)

Am. Jour. Conch., vol. 4, p. 246. Phila., 1868.
Wm. M. Gabb.

— (sub. gen. Conrad.) **Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 179.
Wash., 1876. F. B. Meek.

— **regia n. s. Conrad. (1875.)**

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh,
1875. W. C. Kerr. App. A, pp. 7-8, pl. 2, fig.
7. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, North Caro-
lina.

— **tippana (Conrad sp.) Conrad. (1868.)**

Am. Jour. Conch. vol. 4, p. 246, pl. 18, fig. 5.
Phila., 1868. T. A. Conrad.

Formation: Cretaceous.

— **tippana (Con.) Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, pp. 154-155, pl.
22, figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Deep cut of the Holmdel and Keyport
turnpike, Monmouth county, and at Rev. G. C.
Schanck's pits, Marlborough, and from Cream
ridge, New Jersey.

Aporrhais (Petiver) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 330. Phila., 1855-1858. T. A. Conrad.

— (Dillw.) **Gabb. (1876.)**

Proc. Acad. Nat. Sci., Phila., for 1876, p. 299.
Phila., 1876. Wm. M. Gabb.

— (Dillwyn typical) **Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 320.
Wash., 1876. F. B. Meek.

— (Dillwyn) **Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 320-322.
Wash., 1876. F. B. Meek.

— **angulata n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 128, pl. 20,
fig. 84. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bull's Head point, near Martinez, Cal.

— **biangulata (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 322-323,
pl. 19, figs. 6a-c, fig. 37, p. 322. Wash., 1876.
F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and
fifty miles from its mouth.

— **? bicarinata n. s. Gabb. (1876.)**

Proc. Acad. Nat. Sci. Phila., for 1876, pp. 299-
300. Phila., 1867. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia.

— **californica n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, pp. 128-129, pl.
29, figs. 230a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Orestimba cañon; Martinez; Puerto
cañon, Stanislaus county; Siskiyou mountain,
California.

Aporrhais—Continued.— **decemlirata n. s. Conrad. (1858.)**

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, pp. 330-331, pl. 35, fig. 11. Phila., 1855-
1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the
town of Ripley, Miss.

— **exilis n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 129, pl. 29, fig.
231. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **falciformis n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, pp. 127-128, pl.
20, fig. 83. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs; Chico creek; Pence's
ranch, Butte county; Texas Flat, Placer
county, California.

— **meeki n. s. Whitfield. (1877.)**

U. S. Geogr. and Geol. Sur. Rocky Mt. region;
Prelim. Rep. Paleont. Black hills, p. 37. Wash.,
1877. R. P. Whitfield.

Form: Cretaceous.

Location: On the Cheyenne river near Rapid
creek, Black hills, Dakota.

— **meeki Whitfield. (1880.)**

Rep. Geol. Black hills of Dakota, p. 426, pl. 12,
fig. 5. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river near Rapid
creek, Black hills.

— **newberryi (Meek). Whitfield. (1880.)**

Rep. Geol. Black hills of Dakota, pp. 425-426,
pl. 12, fig. 4. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Rio de la Plata.

— **parva n. s. (M. & H.) (1860.)**

Proc. Acad. Nat. Sci., Phila., for 1860, p. 178.
Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and
fifty miles above the mouth, Nebraska.

— **sublevis n. s. M. & H. (1860.)**

Proc. Acad. Nat. Sci., Phila., for 1860, p. 178.
Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, Nebraska.

— **(Goniocheila) castorensis n. s. Whitfield. (1877.)**

U. S. Geogr. and Geol. Sur. Rocky Mt. region;
Prelim. Rep. Paleont. Black hills, p. 38. Wash.,
1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek,
Black hills.

— **(Goniocheila) castorensis Whitfield. (1880.)**

Rep. Geol. Black hills of Dakota, p. 427, pl. 12,
fig. 1. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: East fork of Beaver creek, Black hills.

Aporrhais—Continued.

- *sp. undet. Whiteaves.* (1874.)
 Geol. Sur. Can. Rep. Prog. for 1873-1874, p. 263.
 Montreal, 1874. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Nanaimo river, Vancouver island, two
 and one-fourth and two and one-half miles up.

Aptychus (Meyer) Barcena. (1877.)

An. Museo. Nac. Mex., tomo, 1, pp. 89, 90.
 Mexico, 1877-1879. M. Barcena.

— *arenasii* Barcena. (1877.)

An. Museo. Nac. Mex. tomo 1, pp. 90, 91, figs.
 4-6. Mexico, 1877-1879. M. Barcena.
 Formation: Mesozoic.
 Location: Peñon Blanco mountains, San Luis
 Potosi, Mexico.

Arbacia sp. undet. Roemer. (1849.)

Texas, p. 392. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: New Braunfels, Texas.

Arca [Linn.] Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 45. New Haven,
 1820. Thomas Say.
 Formation: Alluvium (Cretaceous).
 Location: New Jersey.

— *altirostris n. s. Gabb.* (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 325.
 Phila., 1862. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Crosswicks, New Jersey.

— *altirostris* (Gabb) Whitfield. (1885.)

Mong. U. S. Geol. Survey, vol. 9, pp. 82-83, pl. 12,
 figs. 22, 23. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Crosswicks? New Jersey.

— *breweriana n. s. Gabb.* (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 193-194,
 pl. 25, fig. 181. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Cottonwood creek, Shasta county;
 Tuscan Springs, Tehama county, Cal.

— *? coalvillensis n. s. White.* (1876.)

Rep. Geol. Uinta Mts., pp. 115-116. Wash., 1876.
 C. A. White.
 Formation: Cretaceous.
 Location: Coalville, Utah.

— *decurtata n. s. Gabb.* (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 195, pl. 31,
 figs. 265, 265a. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Rag Cañon, Napa county, California.

— *equilateralis n. s. Meek.* (1858.)

Trans. Albany Inst., vol. 4, pp. 39, 40. Albany,
 1858-1864. F. B. Meek.
 Formation: Cretaceous.
 Location: Nanaimo, Vancouver island.

— *? equilateralis (Meek sp.) Meek.* (1876.)

Bull. U. S. Geol. and Geog. Sur. Terr., vol. 2,
 No. 4, p. 357, pl. 2, figs. 6, 6a. Wash., 1876.
 F. B. Meek.
 Formation: Cretaceous.
 Location: Nanaimo?, Vancouver island.

Arca—Continued.— *exaltata* (Nils.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band., 22, p. 233.
 Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: New Jersey.

— *glabra* (Sow.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band. 22, p. 233.
 Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Tinton Falls and Blockwoodtown, New
 Jersey.

— *gratiota n. s. Hill.* (1888.)

Ann. Rep. Geol. Sur. Ark., for 1888, vol. 2,
 p. 133, pl. 4, figs. 2, 2a. Little Rock, 1888.
 R. T. Hill.
 Formation: Cretaceous (?).
 Location: Upper part of gypsum bluffs of the
 Little Missouri river, Arkansas.

— *gravida n. s. Gabb.* (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 194-195
 pl. 30, fig. 264. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Rag Cañon, Napa county, San Luis
 Gonzaga ranch, Pacheco's pass, Cal.

— *hornii n. s. Gabb.* (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 194, pl. 30, fig.
 263. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Near Fort Tejon, California.

— *ligeriensis* (d'Orb.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 233-234.
 Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Tinton Falls, Eatontown, Blackwood-
 town, New Jersey.

— *? parallela n. s. Meek.* (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pp. 303-304. Wash., 1871. F. B. Meek.
 Formation: Cretaceous.
 Location: Twelve miles southwest of Salina, Saline
 county, Kansas.

— *proutiana n. s. Shumard.* (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp.
 601-602. St. Louis, 1856-1860. B. F. Shumard,
 Formation: Cretaceous.
 Location: Comanche peak and Parker county, near
 the Brazos river, Texas.

— *quindecemradiata n. s. Gabb.* (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 95, pl. 2,
 fig. 1. Phila., 1861. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Northerly portions of New Jersey.

— *quindecimradiata* (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 208, pl. 27, figs.
 10-13. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Near New Egypt, New Jersey.

Arca—Continued.

- **rostellata** n. s. Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 64, pl. 3, fig. 11. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Alabama.
- **saffordii** n. s. Gabb. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 397, pl. 68, fig. 37. Phila., 1858-1860. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Hardeman county, Tennessee.
- **subelongata** n. s. Conrad. (1857.)
 Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 148, pl. 6, figs. 3a, b. Wash., 1857. T. A. Conrad.
 Formation: Cretaceous.
 Location: Between El Paso and Frontera.
- **sulcatina** n. s. E. & S. (1857.)
 Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 39. St. Louis, 1856-1860. Evans & Shumard.
 Formation: Cretaceous.
 Location: Woods fork, three miles from Grand river.
- **trapezoidea** (Gein.) Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges., Band. 22, p. 234. Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Brownville, New Jersey.
- **uniopsis** n. s. Conrad. (1853.)
 Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 17. Phila., 1850-1854. T. A. Conrad.
 Formation: Cretaceous.
 Location: Burlington county, New Jersey.
- **vancouverensis** n. s. Meek. (1858.)
 Trans. Albany Inst., vol. 4, p. 40. Albany, 1858-1864. F. B. Meek.
 Formation: Cretaceous.
 Location: Nanaimo, Vancouver Island.
- (**Barbatia**) **parva-missouriensis** n. s. Hill. (1888.)
 Ann. Rep. Geol. Sur. Arkansas for 1888, vol. 2, p. 133, pl. 4, figs. 5, 4a, 4b, pl. 2, fig. 22. Little Rock, 1888. R. T. Hill.
 Formation: Cretaceous (?).
 Location: Arkansas.
- (**Cucullæa**) **cordata** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 86. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Moreau trading post, Nebraska.
- (**Cucullæa**) **inornata** n. s. M. & H. (1858.)
 Proc. Acad. Nat. Sci., Phila., for 1858, p. 51. Phila., 1859. Meek & Hayden.
 Formation: Jurassic.
 Location: Southwestern base of Black hills; also, around Bear butte, on east side of Black hills.
- (**Cucullæa**) **shumardi** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 86. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Moreau trading post, Nebraska.

Arca—Continued.

- (**Macrodon**) **eufalensis** n. s. Gabb. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 398, pl. 68, fig. 38. Phila. 1858-1860. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Eufaula, Alabama.
- **sp. undet.** Roemer. (1849.)
 Texas, p. 404. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg, Texas.
- **sp. undet.** Roemer. (1849.)
 Texas, p. 404. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Ford, near New Braunfels, Texas.
- **sp. undet.** Roemer. (1852.)
 Kreide. von Texas, p. 53. Bonn, 1851. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg, Tex.
- **sp. undet.** Roemer. (1852.)
 Kreide. von Texas, p. 53. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Ford of the Guadalupe, New Braunfels, Texas.
- —. Whiteaves. (1882.)
 Proc. and Trans. Roy. Soc., Canada, vol. 1, sec. 4, p. 85. Montreal, 1883. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: North slope of Jackass mountain, Canada.
- Arcestes** (Suess) Hyatt. (1877.)
 Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, pp. 119-120. Wash., 1877. Alpheus Hyatt.
- **? cirratus** n. s. White. (1880.)
 Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 6, pp. 116-117. Wash., 1880. C. A. White.
 Formation: Jura-Trias. [Triassic.]
 Location: Locality No. 1, southeastern Idaho.
- **cirratus** White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 116-117. Wash., 1883. C. A. White.
 Formation: Triassic.
 Location: Locality No. 1. Within the limits of Idaho, about sixty-five miles north of the boundary line between that territory and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles west of Gray's lake.
- **gabbi** n. s. Meek. (1877.)
 Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, pp. 121-123, pl. 10, figs. 6a, b. Wash., 1877. F. B. Meek.
 Formation: Triassic.
 Location: West Humboldt range, near Cottonwood canyon, Nevada.
- **gabbi** (Meek) Whiteaves. (1887.)
 Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886. App. 1, p. 110 B. Montreal, 1887. J. F. Whiteaves.
 Formation: Triassic.
 Location: Bay five and one-half miles west of Cape Commerell, north end of Vancouver island.

Arcestes—Continued.

- **gabbi** (Meek) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can.;
Paleont., vol. 1, pt. 2, p. 141. Montreal, 1889.
J. F. Whiteaves.
Formation: Triassic.
Location: Bay five and one-half miles west of Cape
Commerell, north end of Vancouver island.
- **? perplanus** n. s. Meek. (1877.)
Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, pp.
120-221, pl. 11, figs. 7, 7a. Wash., 1877. F. B.
Meek.
Formation: Triassic.
Location: Buena Vista canyon, south fork, West
Humboldt range.
- **? White.** (1880.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5,
No. 1, p. 117. Wash., 1880. C. A. White.
Formation: Jura-Trias. (Triassic.)
Location: Locality No. 1, southeastern Idaho.
- **? White.** (1880.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5,
No. 1, p. 117. Wash., 1880. C. A. White.
Formation: Jura-Trias. (Triassic.)
Location: Locality No. 1, southeastern Idaho.
- **? White.** (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 117-118. Wash., 1883. C. A.
White.
Formation: Triassic.
Location: Locality No. 1. Within the limits of
Idaho, about sixty-five miles north of the
boundary line between that territory and Utah,
about eighteen miles west of the boundary line
between Idaho and Wyoming, and about five
miles west of Gray's lake.

Archæoplax n. g. Stimpson. (1863.)

Bost. Jour. Nat. Hist., vol. 7, 1859-1863, p. 584.
Boston, 1863. William Stimpson.

- **signifera** n. s. Stimpson. (1863.)
Bost. Jour. Nat. Hist., vol. 7, 1859-1863, pp. 584-
589, pl. 12, figs. 1-4. Boston, 1863. William
Stimpson.
Formation: Cretaceous.
Location: Gay head, the southwestern extremity
of Marthas Vineyard.

Architectonica (Bolt.) Gabb. (1861.)

Proc. Acad. Nat. Sci. Phila., for 1861, p. 321.
Phila., 1862. Wm. M. Gabb.

- **abbottii** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, pp. 321-322.
Phila., 1862. Wm. M. Gabb.
Formation: Cretaceous.
Location: Mullica hill and Timber creek, New
Jersey; Prairie Bluff, Alabama.
- **cognata** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 117, pl. 20, fig.
72, 72a-e. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Seven miles south of Martinez, near
Clayton; Bull's Head point, near Martinez, Cal.

Architectonica—Continued.

- **hornii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 117-118, pl. 29,
figs. 224, 224a, b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.
- **inornata** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 118, pl. 20, fig.
73. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Southwest of Martinez; Tuscan Springs,
Tehama county, Cal.
- **veatchii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 116-117, pl. 19,
fig. 71. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.
- Arcomya** (Ag.) Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 179. Phila.,
1869. W. M. Gabb.
- **crassissima** n. s. Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halb. Mang. Aleut.
Inseln., p. 127. St. Petersburg, 1871. E. Eich-
wald.
Formation: Cretaceous.
Location: Alaska.
- **undulata** n. s. Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 179, pl. 29, fig.
67. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Indian creek, Butte county, Cal.
- Arcopagella** n. g. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 308-309. Wash., 1871. F. B. Meek.
- **? macrodonta** n. s. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 202-203, pl.
1, fig. 2. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Big Sioux river, three miles above its
mouth.
- **mactroides** n. s. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 309-310, figs. A. & B. text. Wash.,
1871. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Saline
county, Kansas.
- **mactroides** (Meek) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 202, pl. 2, figs.
4a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Saline
county, Kansas.
- Arcopagia** (Leach) Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
149. Wash., 1857. T. A. Conrad.
- **concentrica** (d'Orb.) Eichwald.
Geog.-Paleont. Bemerk. Halb. Mang. Aleutischen
Inseln., p. 171, Taf. 16, figs. 17, 18. St. Peters-
burg., 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

Arcopagia—Continued.**— numismalis (d'Orb.) Eichwald. (1871.)**

Geol. Paleont. Bermerk. Halb. Mang., Aleutischen Inseln., pp. 122-123. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— texana n. s. Roemer. (1852.)

Kreide. von Texas, pp. 46-47, Taf. 6, figs. 8a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Texas.

— texana (Roem.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 149, pl. 4, figs. 3a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon springs, Texas.

Arcoperna n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 5. T. A. Conrad.

— carolinensis n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 5, pl. 1, fig. 6. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, North Carolina.

Arene n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr. App. A., p. 6. T. A. Conrad.

— carolinensis n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr. App. A., pp. 6-7, pl. 2, fig. 19. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, North Carolina.

Arnioceras n. g. Hyatt. (1889.)

Mem. Mus. Comp. Zool., vol. 16, pp. 161-162. Cambridge, 1889. A. Hyatt.

— humboldti n. s. Hyatt. (1889.)

Mem. Mus. Comp. Zool., vol. 16, pp. 173-174, figs. 31-33. Cambridge, 1879. A. Hyatt.

Formation: Jurassic.

Location: Humboldt county, Nevada.

— ? nevadanum (Gabb sp.) Hyatt. (1889.)

Mem. Mus. Comp. Zool., vol. 16, pp. 172-173. Cambridge, 1889. A. Hyatt.

Formation: Lower Lias? [Jurassic?]

Location: Near Volcano, in Nevada.

Arniotites n. g. ms. (Hyatt) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 144-145. Montreal, 1889.

— vancouverensis Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 146, pl. 19, fig. 2. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Three localities in the Queen Charlotte islands; at five on or near the north or north-west coast of Vancouver island; at Hernandez island in the Strait of Georgia.

Arrhoges (sub. gen. Gabb) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 321. Wash., 1876. F. B. Meek.

Artemis (Poli) Conrad. (1853.)

Proc. Acad. Nat. Sci., Phila., vol. 6, 1852-1853, p. 320. Phila., 1854. T. A. Conrad.

— excavata (Mort. sp.) Conrad. (1853.)

Proc. Acad. Nat. Sci., Phila., vol. 6, 1852-1853, p. 320. Phila., 1854. T. A. Conrad.

Formation: Cretaceous.

Location: Arneytown, New Jersey.

Asaphis (Modeer) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 154. Phila., 1864. W. M. Gabb.

— multicostata n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 181, pl. 29, fig. 70. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Crooked creek of the Des Chutes river, Central Oregon, east of the Cascade mountains.

— undulata n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 154, pl. 22, fig. 129. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county, Cal.

Aspidospira saxipara n. s. Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 38. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Astacus (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

— sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: Chesapeake and Delaware canal.

— sp. undet. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 74. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Delaware.

Astarte (Sow.) Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 276. Phila., 1850-1854. T. A. Conrad.

— annosa n. s. Conrad. (1868.)

Am. Jour. Conch., vol. 4, p. 279, pl. 20, fig. 5. Phila., 1868. T. A. Conrad.

Formation: Triassic. [Cretaceous.]

Location: South river, New Jersey.

— appressa n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, pp. 12-13, pl. 5, fig. 10. Phila., 1870. Wm. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nevada.

Astarte—Continued.— **? arenosa** n. s. H. & W. (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, pt. 2, pp. 297-298, pl. 7, figs. 20, 21. Wash., 1877. Hall & Whitfield.

Formation : Jurassic ?

Location : North head of Chalk creek, Utah. Picked up in the débris, and of no stratigraphical importance.

— **caelata** (Müll.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 236. Berlin, 1870. H. Credner.

Formation : Cretaceous.

Location : Woodbury, New Jersey.

— **cardinioides** n. s. Whiteaves. (1874.)

Geol. Sur. Canada Rep. Prog. for 1873-1874, p. 267, pl. (?) fig. 3. Montreal, 1874. J. F. Whiteaves.

Formation : Cretaceous.

Location : Northwest bay, Vancouver island.

— **cardinioides** Whiteaves. (1874.)

Geol. Sur. Canada Rep. Prog. for 1873-1874, p. 262. Montreal, 1874. J. F. Whiteaves.

Formation : Cretaceous.

Location : Northwest bay, Vancouver island.

— **carlottensis** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Canada, Cont. Can. Paleont., vol. 1, pt. 2, pp. 154-155. Montreal, 1889. J. F. Whiteaves.

Formation : Cretaceous.

Location : East side of Alliford bay, Moresby island, Q. C. I., south side of Alliford bay ; east end of Maud island, in Skidegate channel, Q. C. I.

— **carlottensis** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Canada, Cont. Can. Paleont., vol. 1, pt. 2, p. 168. Montreal, 1889. J. F. Whiteaves.

Formation : Cretaceous.

Location : Rocky mountains, three miles north of the east end of Devil's lake, Northwest territory.

— **conradiana** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 178, pl. 24, fig. 161. Phila., 1864. W. M. Gabb.

Formation : Cretaceous.

Location : Texas Flat, Placer county, Cal.

— **conradiana** (Gabb) Whiteaves. (1879.)

Geol. Sur. Canada Mes. Foss., vol. 1, pt. 2, p. 160, pl. 18, fig. 5, 5a. Montreal, 1879. J. F. Whiteaves.

Formation : Cretaceous.

Location : Sucia islands.

— **conradiana** var. **tuscan**a (Gabb.) Whiteaves. (1879.)

Geol. Sur. Canada, Mes. Foss., vol. 1, pt. 2, pp. 160-161, pl. 18, fig. 6. Montreal, 1879. J. F. Whiteaves.

Formation : Cretaceous.

Location : Northwest bay, Vancouver island ; Sucia islands.

Astarte—Continued.— **corbicula** n. s. Conrad. (1867.)

Amer. Jour. Conch., vol. 3, p. 12. Phila., 1867. T. A. Conrad.

Formation : Cretaceous.

Location : Haddonfield, New Jersey.

— **crenalirata** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 282-283, pl. 46, fig. 25. Phila., 1858-1860. T. A. Conrad.

Formation : Cretaceous.

Location : Eufaula, Alabama.

— **evansi** (H. & M.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, p. 413, pl. 11, fig. 13. Wash., 1880. R. P. Whitfield.

Formation : Cretaceous.

Location : On the Cheyenne river, near Rapid creek, Black hills.

— **fragilis** n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 183. Phila., 1861. Meek & Hayden.

Formation : Jurassic.

Location : Southwest base of the Black hills, Nebraska.

— **fragilis** M. & H. (1865.)

Paleont. upper Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 94, pl. 4, fig. 7. Wash., 1865. Meek & Hayden.

Formation : Jurassic.

Location : Southwest base of the Black hills.

— **fragilis** (M. & H.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, pp. 405-406. Montreal, 1878. J. F. Whiteaves.

Formation : Jurassic.

Location : Iltasyouco river.

— **fragilis** (M. & H.) Whiteaves. (1878.)

Geol. Sur. Canada, Rep. Prog. for 1876-1877, p. 155. Montreal, 1878. J. F. Whiteaves.

Formation : Jurassic.

Location : Iltasyouco river, British Columbia.

— **? fragilis** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 363-364, pl. 5, figs. 32, 33. Wash., 1880. R. P. Whitfield.

Formation : Jurassic.

Location : Redwater valley, Black hills.

— **germani** (Pict. et Camp.) Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, p. 177, Taf. 15, fig. 13. St. Petersburg, 1871. E. Eichwald.

Formation : Cretaceous.

Location : South shore of Tukusitun bay and west shore of Kenai bay, Alaska.

— **gregaria** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 84. Phila., 1857. Meek & Hayden.

Formation : Cretaceous.

Location : Yellowstone river, Nebraska.

Astarte—Continued.

- **inornata n. s. M. & H.** (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 183.
Phila., 1861. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills, Nebraska.
- **inornata M. & H.** (1865.)
Paleont. upper Missouri; Smithson. Cont. Knowl., vol. 14, No. 172, p. 94, pl. 3, figs. 12, *a*, *b*. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **lævis n. s. Eichwald.** (1871.)
Geog.-Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, p. 178, Taf. 16, fig. 27. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **lineolata n. s. Roemer.** (1849.)
Texas, p. 404. Bonn, 1849. Roemer.
Formation: Cretaceous.
Location: Ford near New Braunfels, Tex.
- **lineolata Roemer.** (1852.)
Kreide. von Texas, p. 51, Taf. 7, figs. 8a-c. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of the Guadalupe, New Braunfels, Texas.
- **mathewsonii n. s. Gabb.** (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 179, pl. 30, fig. 258. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez, California.
- **octolirata n. s. Gabb.** (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-1860, pp. 394-395, pl. 68, fig. 27. Phila., 1858-1860. Wm. M. Gabb.
Formation: Cretaceous.
Location: Eufaula, Alabama.
- **packardi n. s. White.** (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 149, pl. 37, figs. 6a, b. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Near Como station, Wyoming.
- **packardi (White) Whiteaves.** (1884.)
Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 229-230, pl. 30, figs. 6, 6a, b. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East side of Alliford bay; south side of Alliford bay; east end of Maud island.
- **packardi (White) Whiteaves.** (1887.)
Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser. 1886. App. I, p. 112 B. Montreal, 1887. J. F. Whiteaves.
Formation: Cretaceous.
Location: East side of Winter harbor, Forward inlet.

Astarte—Continued.

- **parilis n. s. Conrad.** (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 276, pl. 24, fig. 16. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Monmouth county, New Jersey.
- **paulina n. s. Eichwald.** (1871.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, p. 133. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: St. Paul island, Alaska.
- **? staminea n. s. Conrad.** (1870.)
Am. Jour. Conch., vol. 6. Phila., 1870-1871, p. 73. Phila., 1871. T. A. Conrad.
Formation: Cretaceous.
Location: Ripley Co., Miss. [Ripley, Tippah Co., Miss.]
- **texana n. s. Conrad.** (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 152, pl. 5, fig. 9. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Western Texas.
- **thomasii n. s. Conrad.** (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 267. Phila., 1856. T. A. Conrad.
Formation: Miocene [Cretaceous?].
Location: Near Mullica hill, New Jersey.
- **tuscanana n. s. Gabb.** (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 179, pl. 30, fig. 257. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan Springs; Pence's ranch, Butte county, California.
- **vancouverensis n. s. Whiteaves.** (1874.)
Geol. Sur. Canada, Rep. Prog. for 1873-1874, pp. 267-268, pl. [not numbered], fig. 4. Montreal 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island: coast a little west of Northwest bay.
- **vancouverensis Whiteaves.** (1874.)
Geol. Sur. Canada, Rep. Prog. for 1873-1874, p. 262. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- **ventricosa n. s. Meek.** (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 50, pl. 8, figs. 5, 5a. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genessee valley, Plumas county, Cal.
- **ventricosa (Meek) Whiteaves.** (1878.)
Geol. Sur. Canada, Rep. Prog. for 1876-1877, p. 155. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.
- **ventricosa (Meek) Whiteaves.** (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 405. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

Astarte—Continued.— **veta n. s.** Conrad. (1868.)

Am. Jour. Conch., vol. 4, p. 279, pl. 20, fig. 4. Phila., 1868. T. A. Conrad.

Formation: Triassic [Cretaceous].

Location: South River, New Jersey.

— **veta (Con.)** Whitfield. (1884.)

Mon. U. S. Geol. Sur., vol. 5, pp. 23-24, pl. 2, fig. 1. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near Washington, Middlesex county, New Jersey.

— **washitensis n. s.** Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, pp. 206-207, pl. 3, fig. 3. Wash., 1864. B. F. Shumard.

Formation: Cretaceous.

Location: Camp No. 4, Cross Timbers, Texas.

— **sp. undet.** Urquiza. (1882.)

An. Min. Fomento Rep. Mex., tomo 7, p. 224, fig. 14. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Dolores mine, Coalcoman district, state of Michoacan, Mexico.

(=A. minima in list).

— **? Lyell.** (1847.)

Quart. Jour. Geol. Soc., Lond., vol. 3, p. 275, fig. 6b. London, 1847. C. Lyell.

Formation: Jurassic? (Triassic?)

Location: Near Blackheath, Virginia.

Asterias [Linn.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 74. Phila., 1834. S. G. Morton.

— **? dubium n. s.** Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. region, Prel. Rep. Paleont. Black hills, p. 15. Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: Park sands seventy feet above the red beds, on the east side of Spearfish creek, near its junction with the Redwater, northeast of Crow peak, Black hills, Dakota.

— **? dubium** Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 344-345, pl. 3, fig. 3. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: On the east of Spearfish creek, near its junction with the Redwater, Black hills, Dakota.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 74. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: South Carolina.

Astrea cretacea n. s. Bölsche. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 216-217. Berlin, 1870. Wilh. Bölsche.

Formation: Cretaceous.

Location: Woodbury and Haddonfield, New Jersey.

Astrocoenia (E. & H.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 208. Phila., 1864. W. M. Gabb.

Astrocoenia—Continued.— **guadalupæ n. s.** Roemer. (1849.)

Texas, pp. 391-392. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Hill north of New Braunfels, Texas.

— **guadalupæ** Roemer. (1852.)

Kreide. von Texas, p. 87, Taf. 10, figs. 8, a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Left bank of Comal creek, near New Braunfels, Texas.

— **irregularis n. s.** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 246, pl. 33, fig. 1. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island, Skidegate channel, west of Alliford bay.

— **? petrosa n. s.** Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 208, pl. 31, figs. 274. 274a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: One mile west of Martinez, California.

Ataphrus n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 171. Phila., 1869. W. M. Gabb.

— **compactus** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 303. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: North Carolina.

— **crassus n. s.** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 171, pl. 28, fig. 54. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, California.

— **kerri n. s.** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 303-304, pl. 17, fig. 10. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: North Carolina.

Athleta n. sub. gen. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-1860, p. 292. Phila., 1858-1860. T. A. Conrad.

Atresius n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 168-169. Phila., 1869. W. M. Gabb.

— **liratus n. s.** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 169, pl. 28, fig. 50. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Colusa county, southeast of the Hot Sulphur Springs, California.

Aturia (Bronn) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 59. Phila., 1864. W. M. Gabb.

— **mathewsonii n. s.** Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 59-60, pl. 17, fig. 31. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez and Clayton (Div. A), and Cañada de las Uvas (Div. B Cal.)

Asturia—Continued.**— mathewsonii (Gabb) Conrad. (1867.)**

Am. Jour. Conch. vol. 3, p. 6. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

Location: California.

Aucella (Keyserling) Meek. (1865.)

Geol. Sur. Cal., Geology, vol. 1, p. 479. Phila., 1865. F. B. Meek.

— concentrica (Fisch.) Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. Aleutischen Inseln, pp. 186-187, Taf. 17, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kenai bay, Alaska.

— concentrica (Keyserling) Toula. (1874.)

Die Zweite Deutsche Nordpolarfahrt. Zweiter Band, p. 503. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

— concentrica Fischer. (1875.)

Voyages a la côte Nord-Ouest de l'Amérique, pp. 34-35, pl. a, figs. 4-6, par. Alph. L. Pinart, Paris, 1875. P. Fischer.

Formation: Jurassic [Cretaceous?].

Location: Alaska.

— concentrica White. (1888.)

Mon. U. S. Geol. Sur. vol. 13, pp. 226-232, pl. 4, figs. 11-15. Wash., 1888. C. A. White.

Formation: Cretaceous.

Location: Fossil Point, Port Möller, Alaska.

— concentrica White. (1888.)

Mon. U. S. Geol. Sur. vol. 13, pp. 226-232, pl. 4, figs. 16-20. Wash., 1888. C. A. White.

Formation: Cretaceous.

Location: Near Knoxville, California.

— concentrica White. (1889.)

Mon. U. S. Geol. Sur. vol. 13, pp. 226-232, pl. 4, fig. 21. Wash., 1888. C. A. White.

Formation: Cretaceous.

Location: Washington.

— concentrica var. crassicollis. (Keys.) Toula. (1874.)

Die Zweite Deutsche Nordpolarfahrt. Zweiter Band, p. 504. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

— concentrica var. inflata n. var. Toula. (1874.)

Die Zweite Deutsche Nordpolarfahrt. Zweiter Band, p. 504. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

— concentrica var. rugosa (Keys.) Toula. (1874.)

Die Zweite Deutsche Nordpolarfahrt. Zweiter Band, pp. 503-504, Taf. 2, figs. 2a, d, and fig. 3. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

Aucella—Continued.**— concentrica var. rugosissima n. var. Toula. (1874.)**

Die Zweite Deutsche Nordpolarfahrt. Zweite Band, p. 504, Taf. 2, fig. 4. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

— concentrica var. sublaevis (Keys.) Toula. (1874.)

Die Zweite Deutsche Nordpolarfahrt. Zweiter Band, p. 504. Leipzig, 1874. Franz Toula.

Formation: Jurassic [Cretaceous?].

Location: Kuhn island, east coast of Greenland.

— concentrica Fischer (var.) White. (1884.)

Bull. U. S. Geol. Sur. No. 4, p. 13, pl. 6, figs. 2-12. Wash., 1884. C. A. White.

— concentrica (Fischer) var. White. (1884.)

Bull. U. S. Geol. Sur. No. 4, pp. 13-14, pl. 6. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Fossil Point, Port Möller, Alaska.

— erringtoni (Gabb sp.) Meek. (1865.)

Geol. Sur. Cal., Geology, vol. 1, pp. 479-480, pl. 1, figs. 2, 375, a-d. Phila., 1865. F. B. Meek.

Formation: Jurassic [Cretaceous?].

Location: Mariposa estate, California.

— erringtonii (Meek) White. (1888.)

Mon. U. S. Geol. Sur. vol. 13, pp. 226-232, pl. 4, figs. 6-10. Wash., 1888. C. A. White.

Formation: Cretaceous.

— erringtoni var. linguiformis n. var. Meek. (1865.)

Geol. Sur. Cal., Geology, vol. 1, p. 481, pl. 1, figs. 1, 1a. Phila., 1865. F. B. Meek.

Formation: Jurassic [Cretaceous?].

Location: Mariposa estate, California.

— mosquensis (Buch.) Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. Aleutischen Inseln., pp. 185-186, Taf. 17, figs. 7-12. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— mosquensis ? (Von Buch.) Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, pp. 74-78, pl. 10, figs. 3, 3a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— mosquensis var. concentrica. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 151-153. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Aucella—Continued.

Location: Tatlayoca lake, B. C., banks of the upper Skagit river, B. C., Browning creek, Forward inlet, Quatsino sound, northwest coast of Vancouver island, Long island; Harrison lake, B. C.; also west shore and peninsula on the southeast shore of the same lake, and Chilliwack river, near Tamiashai, B. C.; west side of Winter harbor, in Forward inlet; west of Fraser river, B. C., a little to the north of sources of Bridge river, B. C., from a mountain six or seven thousand feet high above sea level; south fork of Quesnel river, near the foot of Quesnel lake; Porcupine river, N. W. T., in lat. $67^{\circ} 8' N.$, long. $137^{\circ} 47' W.$; Yukon river, Alaska, eight miles below the Antoine river, in lat. $65^{\circ} 15' N.$, long. $141^{\circ} 40' W.$

— **piochii** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 194–195, pl. 32, figs. 92a–c. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: From Mount Diablo, at various points along the east face of the Coast range to the north end of the Sacramento valley; Washington, east of Puget sound; Colusa county, east of Clear lake, California.

— **piochii** (Gabb) Whiteaves. (1882.)

Proc. and Trans. Roy. Soc., Canada, vol. 1, sec. 4, pp. 84, 85. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: Tatlayoca lake and Forward inlet, banks of the upper Skagit.

— **piochii** (Gabb) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, p. 239. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Skidegate inlet, west of Alliford bay.

— **piochii** (Gabb) Whiteaves. (1887.)

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser. 1886. App. I, pp. 111–112b. Montreal, 1887. J. F. Whiteaves.

Formation: Cretaceous.

Location: Tatlayoca lake, B. C.; banks of the upper Skagit river, B. C.; Browning creek, Forward inlet, Quatsino sound, northwest coast of Vancouver island; Long island, Harrison lake, B. C.; west shore and peninsula on the southeast shore of the same lake, and Chilliwack river, near Tamiashai creek, B. C.; Browning creek, Forward inlet; Raft cove on the west coast of Vancouver island, north of Quatsino sound; west of Fraser river, B. C., a little to the north of sources of Bridge river, B. C.; from a mountain six or seven thousand feet high above sea level, south fork of Quesnel river, near the foot of Quesnel lake.

— **piochii** (Gabb) White. (1888.)

Mong. U. S. Geol. Sur., vol. 13, pp. 226–232, pl. 4, figs. 3–5. Wash., 1888. C. A. White.

Formation: Cretaceous.

— **Fischer.** (1872.)

Comptes Rend., 1872, vol. LXV, p. 1785. Paris, 1872. P. Fischer.

Formation: Jurassic [Cretaceous?].

Location: Alaska.

Aulacoceras carlottense n. s. Whiteaves. (1887.)

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser. 1886. App. I, p. 109b. Montreal, 1887. J. F. Whiteaves.

Formation: Triassic.

Location: Houston Stewart channel, in the Queen Charlotte islands.

Aulacomya (sub. gen. Mörch.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 68. Wash., 1876. F. B. Meek.

Aulopora sp. Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 220. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

Avalana subglobosa n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 64. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau trading post, Nebraska.

Avellana (d'Orb) Meek. (1859.)

N. W. Terr. Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind, p. 184. Toronto, 1859. F. B. Meek.

— (sub. gen. d'Orb.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 283. Wash., 1876. F. B. Meek.

— **concinna** (H. & M. sp.) Meek. (1859.)

N. W. Terr. Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind., p. 184. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: Two creeks, on the Assiniboine, Canada.

— **texana** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856–1860, p. 597. St. Louis, 1856–1860. B. F. Shumard.

Formation: Cretaceous.

Location: Near Bosque creek, in Bosque county, Texas.

Avicula (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 63. Phila., 1834. S. G. Morton.

— **abrupta** n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser. 1850–1854, p. 274, pl. 24, figs. 5, 6. Phila., 1850–1854. T. A. Conrad.

Formation: Cretaceous.

Location: Nimrod Woodward's farm, New Jersey.

— **convexo-plana** n. s. Roemer. (1849.)

Texas, pp. 400–401. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Texas.

— **convexo-plana** Roemer. (1852.)

Kreide. von Texas, pp. 61–62, Taf. 7, figs. 9a–d. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Texas.

Avicula—Continued.

- **cretacea** n. s. Conrad. (1843.)
Rep. Hydrog. Basin upper Mississippi river, I. N. Nicollet. App. C, p. 170. Wash., 1843. T. A. Conrad Formation: Cretaceous.
Location: On the Missouri river.
- **? fibrosa** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 86-87. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Forks of Cheyenne river, Nebraska.
- **haydeni** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 382, pl. 1, figs. 5, a, b. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: On the Missouri near Red Cedar island, twenty-five miles below Fort Pierre.
- **homfrayi** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 29-30, pl. 6, fig. 26. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Star district, Humboldt county, Nevada.
- **iridescens** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, pp. 203-204. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Head of Pine creek, Lamar county, Texas.
- **laripes** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 63, pl. 17, fig. 5. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Delaware.
- **lineata** (Roem.) Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln., pp. 187-188, Taf. 16, fig. 5. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **linguæformis** n. s. (E. & S.) (1854.)
Proc. Acad. Nat. Sci., Phila., vol. 7, p. 153. Phila., 1856. Evans & Shumard.
Formation: Cretaceous.
Location: Sage creek, Nebraska.
- **linguæformis** (E. & S.) Meek. (1859.)
N. W. Terr., Rep. Prog. Assin. and Saskat. Expl. Exped. H. Y. Hind, p. 183, pl. 1, fig. 6. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: Sandy hills, south branch, Saskatchewan. Height of land in the Qu'Appelle valley, near the elbow of south branch of the Saskatchewan, Canada.
- **mucronata** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 30, pl. 5, fig. 27. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Gifford's ranch, Plumas county, Cal.
- **nebrascana** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 38. St. Louis, 1856-1860. Evans & Shumard.
Formation: Cretaceous.
Location: Near Moreau river, Nebraska territory.

Avicula—Continued.

- **nebrascana** (E. & S.) Meek. (1859.)
N. W. Terr. Rep. Prog. Assin. and Saskat. Expl. Exped. H. Y. Hind, p. 183, pl. 1, fig. 7. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: South branch of the Saskatchewan, Canada.
- **parkensis** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 115. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: South of Grand river, Middle park, Colorado.
- **pedernalis** n. s. Roemer. (1849.)
Texas, p. 400. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Texas.
- **pedernalis** Roemer. (1852.)
Kreide. von Texas, p. 61, Taf. 8, figs. 1a, b. Bonn, 1852.
Formation: Cretaceous.
Location: Fredericksburg, Texas.
- **pellucida** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 186-187, pl. 25, fig. 172. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez; ranch of San Luis Gonzaga, Pacheco's Pass, California.
- **petrosa** n. s. Conrad. (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 274, pl. 24, fig. 15. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Chesapeake and Delaware canal.
- **planiuscula** n. s. Roemer. (1849.)
Texas, p. 401. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall, near New Braunfels, Texas.
- **planiuscula** Roemer. (1852.)
Kreide. von Texas, p. 62, Taf. 7, fig. 7. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New Braunfels, Texas.
- **rarocostata** n. s. Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halb. Mang. Aleutischen Inseln., p. 188, Taf. 16, figs. 6-8. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska peninsula.
- **subgibbosa** n. s. M & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 180. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Long lake, Nebraska.
- **triangularis** n. s. (E. & S.) (1854.)
Proc. Acad. Nat. Sci., Phila., vol. 7, p. 163. Phila., 1856. Evans & Shumard.
Formation: Cretaceous.
Location: Sage creek, Nebraska.

Avicula—Continued.

- **volgensis** (d'Orb) Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halb. Mang. Aleutischen
Inseln., p. 189, Taf. 16, figs. 9, 10. St. Peters-
burg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

— **(Monotis) tenuicostata n. s. M. & H.** (1858.)

- Proc. Acad. Nat. Sci., Phila., for 1858, pp. 50-51.
Phila., 1859. Meek & Hayden.
Formation: Jurassic.
Location: Southwestern and eastern sides of
Black hills.

— **(Oxytoma?) gastroides n. s. Meek.** (1873.)

- Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pp. 491-492. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.

— **(Oxytoma) mucronata (M. & H.) Whitfield.** (1880.)

- Rep. Geol. Black hills of Dakota, pp. 357-358, pl.
4, figs. 1, 2. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Two miles south of the Belle Fourche
river, near Bear Lodge butte, Black hills.

— **(Pseudoptera) propleura n. s. Meek.** (1873.)

- Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pp. 489-490. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.

— **(Pseudoptera) rhytrophora n. s. Meek.** (1873.)

- Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pp. 490-491. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.

— **sp. undet. Morton.** (1830.)

- Am. Jour. Sci., 1st ser., vol. 17, p. 286. New
Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: United States.

— **sp. undet. Morton.** (1834.)

- Synop. Org. Rem. Cret. Gr. U. S., p. 63. Phila.,
1834. S. G. Morton.
Formation: Cretaceous.
Location: Delaware.

Aviculopecten (McCoy.) H. & W. (1877.)

- Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
p. 288. Wash., 1877. Hall & Whitfield.

— **altus n. s. White.** (1880.)

- Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No.
1, p. 110. Wash., 1880. C. A. White.
Formation: Jura-Trias. [Triassic].
Location: Locality No. 3, southeastern Idaho.

Aviculopecten—Continued.

— **idahoensis (Meek) White.** (1880.)

- Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No.
1, pp. 110-111. Wash., 1880. C. A. White.
Formation: Jura-Trias. [Triassic].
Location: About sixty-five miles north of the
boundary line between Idaho and Utah, about
eighteen miles west of the boundary line be-
tween Idaho and Wyoming, and about five
miles south of John Gray's lake. Locality No.
1. Also, locality No. 3.

— **? idahoensis (Meek) White.** (1883.)

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 110-111, pl. 32, fig. 2a. Wash.,
1883. C. A. White.
Formation: Triassic.
Location: Locality No. 1. Within the limits of
Idaho, about sixty-five miles north of the
boundary line between that territory and Utah,
about eighteen miles west of the boundary line
between Idaho and Wyoming, and about five
miles west of Gray's lake.

— **pealei n. s. White.** (1880.)

- Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No.
1, pp. 109-110. Wash., 1880. C. A. White.
Formation: Jura-Trias [Triassic].
Location: Southeastern Idaho.

— **? pealei White.** (1883.)

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 109-110, pl. 32, fig. 4a. Wash.,
1883. C. A. White.
Formation: Triassic.
Location: Locality No. 1. Within the limits of
Idaho, about sixty-five miles north of the
boundary line between that territory and Utah,
about eighteen miles west of the boundary line
between Idaho and Wyoming, and about five
miles west of Gray's lake.

— **? superstrictus n. s. White.** (1883.)

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 144, pl. 37, fig. 4a, b. Wash.,
1883. C. A. White.
Formation: Jurassic.
Location: Head of Lincoln valley.

— **(Eumicrotis?) augustensis n. s. H. & W.** (1877.)

- Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
p. 288, pl. 7, figs. 14-16. Wash., 1877. Hall &
Whitfield.
Formation: Jurassic.
Location: Shoshone springs, Augusta mountains.

— **(Pseudomonotis?) idahoensis n. s. White.** (1872.)

- Fifth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pp. 374-375. Wash., 1872. F. B. Meek.
Formation: Jurassic.
Location: Lincoln valley, near Fort Hall, Idaho.

Axinæa (Poli) Gabb. (1860.)

- Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-
1860, p. 396. Phila., 1858-1860. W. M. Gabb.

Axinæa—Continued.

- **alta** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 101, pl. 11, figs. 26-29. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: C. Bruere's pits, Walnford; also at upper Freehold, New Jersey.
- **hamula** (Morton sp.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 317-318. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Georgia.
- **holmesiana** n. s. White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 59-60, pl. 20, figs. 2a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks station, Bitter creek valley, Wyoming.
- **mortoni** n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 44, pl. 1, fig. 14. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Crosswicks, New Jersey.
- **mortoni** (Con.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 99-101, pl. 11, figs. 23-25. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel; Walnford; Manalapan; George Hunt's pits; Crosswicks, New Jersey.
- **rotundata** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 396, pl. 68, fig. 33. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Eufaula, Alabama.
- **sagittata** Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 196. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
- **sagittata** (Gabb?) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 39. Wash., 1889. C. A. White.
Formation: Cretaceous, Vancouver group.
Location: Sucia island.
- **subaustralis** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila. for 1861, p. 365. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- **subimbricata** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 95-96, pl. 28, figs. 14a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Heart river.
- **veatchii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 197, pl. 25, figs. 183, 183a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county; Texas Flat, Placer county; Pence's ranch, Butte county; Cow creek, Shasta county; Orestimba cañon, Stanislaus county; San Diego, California.

Axinæa—Continued.

- **veatchii** (Gabb) Whiteaves. (1874.)
Geol. Sur. Canada, Rep. Prog. for 1873-1874, p. 262. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Coast, a little west of Northwest bay, Vancouver island.
- **veatchii** (Gabb) Whiteaves. (1879.)
Geol. Sur. Can.: Mes. Foss., vol. 1, pt. 2, p. 162. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island; Blunden point; Northwest bay; entrance to Departure bay, Vancouver island; Sucia islands.
- **veatchii** (Gabb) var. Whiteaves. (1874.)
Geol. Sur. Canada, Rep. Prog. for 1873-1874, p. 261. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- **wyomingensis** n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 149-150, figs. 2, 3, text. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: East side of Cooper creek, near Old Stage station; Laramie Plains, Wyoming.
- **(Limopsis?) sagittata** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 197-198, pl. 31, figs. 267-267a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon; Martinez, California.
- **sp. undet.** Whiteaves. (1874.)
Geol. Sur. Canada: Rep. Prog. for 1873-1874, p. 265. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Gabriola island.
- **? Whiteaves.** (1874.)
Geol. Sur. Canada, Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two and one-quarter and two and one-half miles up.
- Baculites**, (Lam.) Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, p. 40, New Haven, 1820. Thomas Say.
- **(Lam.) Meek.** (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 392. Wash., 1876. F. B. Meek.
- **annulatus** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 265. Phila., 1856. T. A. Conrad.
Formation: Cretaceous.
Location: Dallas county [Texas].
- **asper** n. s. Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 23, p. 291, New Haven, 1833. S. G. Morton.
Formation: [Cretaceous].
Location: Alabama.

Baculites—Continued.— **asper** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 43, 44, pl. 1, figs. 12, 13; pl. 13, fig. 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Cahawba and Prairie Bluff, Alabama.

— **asper** (Morton) Roemer. (1849.)

Texas, p. 416, Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— **asper** (Mort.) Roemer. (1852.)

Kreide. von Texas, p. 36, Taf. 2, figs. 2a-d. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

— **asper** (Morton?) Meek. (1876.)

Rep. U. S. Geol. Sur., Terr., vol. 9, pp. 404, 405, pl. 39, figs. 10a, d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the mouth of Judith River, Montana.

— **asper** (Mort.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 1, p. 82. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky Spring Ridge, near MacLeod Benton trail; west flank of West Butte, Montana, but close to the forty-ninth parallel.

— **anceps** (Lam.) Roemer. (1849.)

Texas, p. 416, Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— **anceps** (Lam.) Roemer. (1852.)

Kreide. von Texas, pp. 36, 37, Taf. 2, figs. 3a-g, Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of Guadalupe below New Braunfels and at the crossing of the Cibolo between New Braunfels and San Antonio, Tex.

— **anceps** (Lam.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 395, 396. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

— **anceps** var. **obtusus**, n. var. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 406-408, figs. 57-60, p. 406. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Deer creek, on the North Platte [Nebraska].

— **anceps** var. **obtusus** Meek. (1876.)

Rep. Expl. Exped., Santa Fe, New Mexico, to junction of Grand and Green rivers, pp. 130-132, pl. 2, figs. 1a-h. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Rio de la Plata [Colorado].

— **baculus** n. s. M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 445. Phila., 1862. Meek & Hayden.

Formation: Cretaceous.

Location: Deer creek, a tributary of the north branch of Platte river, Nebraska.

Baculites—Continued.— **carinatus** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 44, pl. 13, fig. 1. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

Baculite[s] chicoensis n. s. Trask. (1856.)

Proc. Cal. Acad. Nat. Sci., vol. 1, 1st ed., pp. 85, 86, pl. 2, figs. 2 and 2a. San Francisco, 1854-1857.

J. B. Trask.

Formation: Upper Eocene. [Cretaceous].

Location: Chico Creek, California.

Baculites chicoensis (Trask) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 80, 81, pl. 17, figs. 27, 27a; pl. 14, figs. 27b, 29, 29a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous (Div. A).

Location: Chico creek; Pence's ranch, Butte county; Cottonwood creek, Shasta county; Orestimbo cañon, Stanislaus county; in débris at Point Loma, near San Diego (?) and near Martinez, Cal.

— **chicoensis** (Trask?) Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 364, 365, pl. 4, figs. 2, 2a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Sucia islands.

— **chicoensis** (Trask.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 114. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Southwest side of Denman island; Sucia islands; below Dodd narrows, Vancouver island.

— **chicoensis** (Trask) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 49. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

— **columna** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 44, pl. 19, fig. 8. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

— **compressa** n. s. Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, pp. 41-42. New Haven, 1820. Thomas Say.

Formation: [Cretaceous.]

Location: Missouri river, from White river to the Mandans.

— **compressa** (Say) Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 291 (pl. 9, fig. 1, [vol. 24]). New Haven, 1833. S. G. Morton.

Formation: [Cretaceous.]

Location: Great Bend of the Missouri river.

— **compressus** (Say) Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 1. New Haven, 1833. S. G. Morton.

[Described in vol. 23.]

Baculites—Continued.— **compressus** (Say) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 43, pl. 9, fig. 1. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Missouri river, between White river and the Mandan settlements.

— **compressus** (Say) Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st. ser., 1839-1842, p. 211. Phila., 1839-1842. S. G. Morton.

Formation: Cretaceous.

Location: Great Bend of the Missouri river. (Lat. 43° 40' N.)

— **compressus** (Say) H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 400-402, pl. 5, figs 2, a, b, pl. 6, figs. 8, 9. Cambridge and Boston. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek and Great Bend of Missouri river, etc.

— **compressus** (Say) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 400-404, pl. 20, figs. 3a-c; figs. 55, 56, p. 403. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Upper Missouri river, at or near the Great Bend; on Sage creek; on Cheyenne river; near Milk river.

— **compressus** (Say) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 1, pp. 49, 50. Montreal, 1885. J. F. Whiteaves,

Formation: Cretaceous.

Location: Creek twelve miles east of White Mud river (or Frenchman's creek) and White Mud river near the 49th parallel; also, east branch of the Poplar river, on the 49th parallel; elbow of south Saskatchewan; Bow river, between Horseshoe bend, and Belly river, five miles above Coal Banks; St. Mary river, west of MacLeod-Benton trail; Belly river, twenty-two miles and a half above the mouth of the Waterton; Milk River ridge and Red Deer river, above crossing of Lord Lorne trail; Ross creek, near Irvine station, on the Canadian Pacific railway; Bull Pound creek, section 3 and 15, township 26, range 14, west of 4th principal meridian; Battle river, township 38, between ranges 12 and 13; Berry creek, township 25, range 12, Canada.

— **compressus** (Say) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 2, p. 182. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: "The Nose," township 37, range 8, west of the 4th principal meridian, and Nose creek, township 37, range 9, west of the same meridian; North Saskatchewan, near mouth of Moose Hill creek; same river in township 56, range 5, west of the 4th principal meridian; mouth of Vermilion river, in township 53, range 3, west of the 4th principal meridian; North Saskatchewan river, township 54, range 2, west of 4th meridian, Northwest Territory.

Baculites—Continued.— **compressus** (Say) Brown. (1891.)

Proc. Acad. Nat. Sci. Phila. [vol. 43], pp. 159, 160, figs. 1-6. Phila., 1891. A. P. Brown.

Formation: Cretaceous.

Location: Vicinity of Deadwood, S. Dak.

— **faujasi** (Lam.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 240. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Mullica Hill, New Jersey.

— **gracilis** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 596. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Shawnee creek, Grayson County, Texas.

— **grandis** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5 n. s., pp. 402-404, pl. 7, figs. 1, 2; pl. 8, figs. 1, 2; pl. 6, fig. 10. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Mauvaises Terres, head of Bear creek.

— **grandis** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 398-400, pl. 33, figs. 1a, b; figs. 53, 54, p. 399. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne River, near the Black hills, [S.] Dakota.

— **grandis** (H. & M.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 1, pp. 50, 51. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: East fork of Milk river, in drift bowlders, Canada.

— **grandis** (H. & M.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 2, p. 182. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sounding Creek, township 30, range 8, west of the 4th principal meridian, Northwest Territory.

— **inornatus** n. s. Meek. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 216. Phila., 1862. F. B. Meek.

Formation: Cretaceous.

Location: Sucia island, Gulf of Georgia.

— **labyrinthicus** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 44, pl. 13, fig. 10. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

— **labyrinthicus** (Morton) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 394, 395. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Baculites—Continued.**— occidentalis n. s. Meek. (1861.)**

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 316, 317. Phila., 1862. F. B. Meek.

Formation: Cretaceous.

Location: Komooks, eastern shore of Vancouver island.

— occidentalis (Meek) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 145. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Vancouver island.

— occidentalis Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 366-367, pl. 4, figs. 1, 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Sucia island.

— occidentalis (Meek) Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, p. 115. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island.

— ovata n. s. Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 41. New Haven, 1820. Thomas Say.

Formation: [Cretaceous.]

Location: Neversink hills, Monmouth county, New Jersey.

— ovata (Say) Morton. (1828.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 89-90, pl. 5, fig. 6. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Sandy Hook bay, New Jersey.

— ovatus (Say) Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 196, pl. 5, figs. 5-6, and pl. 8, figs. 6-8. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

(No pl. 8 in the vol.)

— ovatus (Say) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 280. New Haven, 1830. S. G. Morton.

Formation: [Cretaceous.]

Location: Blue marls of Monmouth and Burlington counties, in New Jersey, and at the deep cut of the Chesapeake and Delaware canal.

— ovatus (Say) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 1, figs. 6-8. New Haven, 1830. S. G. Morton.

— ovatus (Say) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 42, 43, pl. 1, figs. 6-8. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey, Delaware, Alabama.

— ovatus (Say) Marcou. (1853.)

Geol. Map of the U. S. and British Provinces of N. A., p. 46, pl. 7, fig. 5. Boston, 1853. Jules Marcou.

Formation: Cretaceous.

Location: New Jersey, Delaware, Alabama, and Texas.

Baculites—Continued.**— ovatus (Say) H. & M. (1854.)**

Mem. Am. Acad. Arts and Sci., vol. 5, n. s. pp. 399, 400, pl. 5, figs. 1a-c; pl. 6, figs. 1-7. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Great Bend of the Missouri and various other localities on that river, between Fort Pierre and the mouth of Big Sioux river.

— ovatus? (Say) Meek. (1858.)

Trans. Albany Inst., vol. 4, pp. 48, 49. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— ovatus (Say) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, pt. 1, pp. 199, 200, pl. 19, figs. 4a-c; 5a-c. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

— ovatus (Say) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 394-397, pl. 20, figs. 2a-d, 1a, b, and figs. 51, 52, p. 397.

Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great Bend of the Missouri below Fort Pierre, Sage creek, and Cheyenne river, and near the eastern base of the Black hills, all in S. Dakota. Along the Missouri, between Fort Benton and Fort Union, and on the Yellowstone river, in Montana, as well as at many localities along the eastern base of the Rocky mountains and elsewhere in Colorado.

— ovatus (Say) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 206. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colorado.

— ovatus (Say) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 185, 186. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Fossil ridge, Colorado.

— ovatus (Say) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear creek, near Morrison, Col.

— ovatus (Say) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 225. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near White River Indian agency, Colorado.

— ovatus (Say?) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— ovatus (Say) Stanton. (1887.)

Proc. Colorado Sci. Soc., vol. 2, pt. 3, for 1877, p. 185. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of Boulder, Col.

Baculites—Continued.— **ovatus** (Say) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 2, pp. 181, 182. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Ghost river, township 25, range 6 west of the fifth principal meridian; North Saskatchewan river, near mouth of Moose Hill creek; also, on the same river, in township 54, range 2, and in township 56, range 5, in each case west of the fourth principal meridian; mouth of Vermilion river, in township 54, range 3, west of the same meridian, Northwest Territory.

— **spillmani** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 335, pl. 35, fig. 24. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **tippaensis** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 334, pl. 35, fig. 27. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **sp. undet.** Troost. (1840.)

Fifth Geol. Rep. Tennessee, p. 53. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: McNairy county, Tennessee.

— **sp. undet.** Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 81, pl. 17, figs. 28, 28a; pl. 14, fig. 28s. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Vancouver island.

— **sp. undet.** Whiteaves. (1874.)

Geol. Sur. Canada; Rep. Prog. for 1873-1874, p. 264. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Below Dodd Narrows.

Balanus peregrinus n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig. 5. New Haven, 1833. S. G. Morton.

Formation: Cretaceous. [Tertiary.]

Location: Southern states.

— **peregrinus** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 72, pl. 10, fig. 5. Phila., 1834. S. G. Morton.

Formation: Cretaceous. [Tertiary.]

Location: South Carolina.

Barbatia (Gray) (typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 77. Wash., 1876. F. B. Meek.

— **barbatula** n. s. White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur., Terr., part 1, p. 19, pl. 11, fig. 5a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Cimarron, New Mexico.

Barbatia—Continued.— **coalvillensis** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235, Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **coalvillensis** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, Wyoming.

— **coalvillensis** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 286, 287, pl. 6, figs. 2a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **(Plagiarca) carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 4, pl. 1, fig. 11. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **(Polynema) lintea** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 4, pl. 1, fig. 12. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **(Polynema?) parallela** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 80-81, pl. 2, fig. 10. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kansas.

Bariosta (subgen. Raf.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 513. Wash., 1876. F. B. Meek.

Baroda (Stoliczka) Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 8. T. A. Conrad.

— **carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, pp. 8, 9, pl. 2, fig. 10. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **subelliptica** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 294, 295, pl. 10, figs. 4a-d. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of the Saint Vrain, northern Colorado.

Baroda—Continued.**— wyomingensis (Meek.) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 293, 294, pl. 10, figs. 3a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of Deer creek, on North Platte, Wyoming.

Bathyomphalus (sub. gen. Ag.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 536. Wash., 1876. F. B. Meek.

Batissa (Gray) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 60. Wash., 1889. C. A. White.

— dubia n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 61, pl. 11, figs. 1 and 2. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Newcastle and Wilkeson. Washington.

— newberryi n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 60, pl. 9, figs. 1-3. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Carbonado, Wilkeson (Fletts creek), and Newcastle, Washington.

Beaumontia (Edwards & Haime.) White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 2, p. 221. Wash., 1880. C. A. White.

— ? solitaria n. s. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 2, p. 221. Wash. 1880. C. A. White.

Formation: Cretaceous.

Location: Fossil creek, sixteen miles west of Greeley and six miles south of Fort Collins, Colorado.

— ? solitaria White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Terr., part 1, p. 8, pl. 12, figs. 13a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Northern Colorado.

Bela (Leach) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 152. Phila., 1869. W. M. Gabb.

— clathrata n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 152, 153, pl. 26, fig. 31. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, California.

Belemnitella (d'Orb.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 501-503. Wash., 1876. F. B. Meek.

— americana (Mort.) Emmons. (1858.)

Rep. N. Carolina Geol. Sur., p. 246, fig. 101. Raleigh, 1858. E. Emmons.

Formation: Cretaceous.

Location: Black rock and Rocky point, North Carolina.

Belemnitella—Continued.**— ? bulbosa n. s. M. & H. (1856.)**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 70. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebraska [S. Dakota].

— bulbosa (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 504, pl. 33, figs. 2a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near Moreau trading-post, [S.] Dakota.

— compressa n. s. Emmons. (1858.)

Rep. N. Carolina Geol. Sur., p. 246, figs. 102, 103. Raleigh, 1858. E. Emmons.

Formation: Cretaceous.

Location: North Carolina.

— manitobensis n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 189-190, pl. 26, figs. 3, 3a, b. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: East bank of the Assiniboine river, a short distance below the mouth of the Little Souris river; Ochre river, Riding mountains; Vermilion river, township 24, range 20 W.; South Duck river, township 34, range 20 W.; Swan river, township 35, range 29 W.; Assiniboine river, section 36, township 8, range 11 W., Manitoba.

— mucronata (Blainv.) Marcou. (1853.)

Geol. Map of U. S. and British Provinces of N. A., p. 46., pl. 7, fig. 3. Boston, 1853. Jules Marcou.

Formation: Cretaceous.

Location: New Jersey, Delaware, Georgia, Arkansas, Tennessee, and Texas.

— mucronata (Schloth.) Cook. (1868.)

Geol. of New Jersey, p. 375. Newark, 1868. G. H. Cook.

Formation: Cretaceous.

Location: New Jersey.

Belemnites absolutus (Fischer) Toul. (1874.)

Die Zweite Deutsche Nordpolarfahrt, Zweiter Band, p. 501, Taf. 2, fig. 1. Leipzig, 1874. Franz Toul.

Formation: Jurassic [Cretaceous?]

Location: Kuhn island, east coast of Greenland.

— ambiguus n. s. Morton. (1830.)

Am. Jour. Sci. 1st ser., vol. 17, p. 281. New Haven, 1830. S. G. Morton.

Formation: [Cretaceous.]

Location: Gloucester county, New Jersey.

— ambiguus Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 192-194, pl. 8, figs. 4, 5. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Gloucester county and near Vincentown, N. J.

(No pl. 8 in vol.)

Belemnites—Continued.

- **ambiguus** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, pl. 1, figs. 4, 5.
New Haven, 1830. S. G. Morton.
- **? ambiguus** Morton. (1834.)
Synop. Org. Rem. Cret. Gr., U. S., pp. 35, 36, pl. 1, figs. 4, 5. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Timber creek, Gloucester county, New Jersey.
- **americanus n. s.** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 281. New Haven, 1830. S. G. Morton.
Formation: [Cretaceous.]
Location: New Jersey.
- **americanus** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, pl. 1, figs. 1-3. New Haven, 1830. S. G. Morton.
- **americanus** Morton. (1830.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 190, pl. 8, figs. 1-3. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Near Arneytown, N. J.
(= pl. 5, fig. 7. No pl. 8 in vol.)
- **americanus** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 34, 35, pl. 1, figs. 1-3, 3a, and pl. 17, fig. 2. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey, Delaware, North Carolina, and Georgia.
- **americanus** Morton. (1841.)
Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 211. Phila., 1839-1842. S. G. Morton.
Formation: Cretaceous.
Location: Great Bend of the Missouri river (lat. 43° 40' N.).
- **conformis n. s.** Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 153, 154, Taf. 11, figs. 20-24. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Chasik island, Tukusitnu bay, Alaska.
- **densus n. s. M. & H.** (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, pp. 58, 59. Phila., 1859. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **densus** M. & H. (1865.)
Paleont. Up. Missouri; Smithsonian. Cont. Knowl., vol. 14, No. 172, pp. 126, 127, pl. 4, figs. 10a-c, and pl. 5, figs. 1, 1a-h. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **densus** (M. & H.) Meek. (1876.)
Rep. Expl. Great Basin Terr., Utah, p. 358, pl. 3, fig. 4a, b. Wash., 1876. W. B. Meek.
Formation: Jurassic.
Location: On the North Platte, near the Red Buttes.

Belemnites—Continued.

- **densus** (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dakota, pp. 381, 382, pl. 6, figs. 15-19. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: On Beaver creek, east of the Belle Fourche, near Bear Lodge butte, Black hills.
- **densus** (M. & H.) Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 194, 195, pl. 22, fig. 1. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: Coal locality south of Skidegate channel, Queen Charlotte islands.
- **impressus n. s.** Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 58, pl. 9, figs. 2, 2a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North fork of Cottonwood creek, southwest of Horsetown, Shasta county, California.
- **impressus** Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 129. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: East side of the Northern Coast Range, more especially in Colusa county, and elsewhere east of Clear lake, California.
- **impressus** (Gabb) Whiteaves. (1883.)
Proc. and Trans. Roy. Soc. Canada, vol. 1, sec. 4, p. 82. Montreal, 1883. J. F. Whiteaves.
Formation: Cretaceous.
Location: Tatlayoco lake; Skagit river; Jackass mountain, Canada.
- **inæquilateralis n. s.** Eichwald. (1871.)
Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 151, 152, Taf. 11, figs. 12-16. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Chasik island, Alaska.
- **macritatis n. s.** White. (1884.)
Bull. U. S. Geol. Sur., No. 4, pp. 14-15, pl. 6, figs. 13-14. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Fossil point, Port Möller, Alaska.
- **mucronatus** (Schlot.) Bronn. (1838.)
Lethæa Geognostica Zweiter Band, pp. 716-718, Taf. 33, figs. 10a-c, 11. Stuttgart, 1838. H. G. Bronn.
Formation: Cretaceous.
Location: Buffiestown, New Jersey; Camden, South Carolina.
- **mucronatus** (Blainv.) Credner. (1870.)
Zeitsch. Deutsch. Geol., Ges. Band 22, pp. 238-240. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Mullica Hill, New Jersey.
- **nevadensis n. s.** Meek. (1877.)
Rep. Geol. Expl. 40th Parallel, vol. 4, pt. 1, pp. 138-139, pl. 12, figs. 7a, b; (8a, b?) Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Cottonwood canon, West Humboldt range; American district, West Humboldt range, Nevada.

Belemnites—Continued.

- **pacificus** n. s. Gabb. (1864.)
Proc. Cal. Acad. Nat. Sci., vol. 3, p. 173. San Francisco, 1863-1868. W. M. Gabb.
Formation: Jurassic [Cretaceous?].
Location: Mariposa estate, Mariposa county, [California.]
- **pacificus** (Gabb) Meek. (1865.)
Geol. Sur. Cal. Geology, vol. 1, p. 482. Phila., 1865. F. B. Meek.
Formation: Jurassic [Cretaceous].
Location: Mariposa estate, California.
- **panderianus** (d'Orb.) Toulou. (1874.)
Die Zweite Deutsche Nordpolarfahrt, Zweiter Band, pp. 500, 501, Taf. 1, figs. 2a-c. Leipzig, 1874. Franz Toulou.
Formation: Jurassic [Cretaceous?].
Location: Kuhn island, east coast of Greenland.
- **pistilliformis** (Bl.) Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 150, 151. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Chasik island, Alaska.
- **sicarius** n. s. Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 152, 153, Taf. 11, figs. 5-8. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaskan peninsula.
- **skidegatensis** nom. prov. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 195-197, pl. 22, fig. 2, 2a-c. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: Skidegate inlet, east side of Alliford bay; south side of same bay.
- **subconicus** (Lam.) Morton. (1828.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 91, 92, pl. 5, fig. 7. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Sandy Hook; Woodward's farm, near Walnford; Mullica Hill, New Jersey; Cockspur island, South Carolina.
- **sp. undet.** Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, p. 44. New Haven, 1820. Thomas Say.
Formation: Alluvium [Cretaceous].
Location: New Jersey.
- **sp. undet.** Toulou. (1874.)
Die Zweite Deutsche Nordpolarfahrt, Zweiter Band, pp. 501, 502. Leipzig, 1874. Franz Toulou.
Formation: Jurassic [Cretaceous?].
Location: Kuhn island, east coast of Greenland.
- **sp. undet.** Whiteaves. (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, p. 14. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.

Belemnites—Continued.

- **sp. undet.** Whiteaves. (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 11-13, pl. 1, figs. 1a-c, and fig. 1, p. 11. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **sp. undet.** (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 172. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.
- **sp. undet.** Meek. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 53, pl. 8, figs. 9, 9a. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genesee Valley, Plumas county, California.
- **sp. undet.** White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 67, pl. 14, fig. 4. Wash., 1889. C. A. White.
Formation: Jurassic.
Location: Kialagvic bay, Alaska.
- **sp. undet.** White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 67, pl. 13, fig. 6. Wash., 1889. C. A. White.
Formation: Jurassic.
Location: Kialagvic bay, Alaska.
- ? **Whiteaves.** (1878.)
Geol. Sur. Can., Rep. Prog. for 1876-77, p. 157. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.
- ? **Whiteaves.** (1878.)
Geol. Sur. Can., Rep. Prog. for 1876-77, p. 157. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.
- ? **Whiteaves.** (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, pp. 407, 408. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.
- ? **Whiteaves.** (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 408. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.
- **Bicrisina** (d'Orb.) G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, pp. 173, 174. Phila., 1862-1863. Gabb & Horn.
- **abbottii** G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, p. 174 [pl. 21], fig. 65. Phila., 1862-1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica Hill, New Jersey.

Biflustra (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, p. 152. Phila., 1862-1863. Gabb & Horn.

— disjuncta n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, pp. 153, 154 [pl. 20], fig. 37. Phila., 1862-1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek and near Mullica Hill, New Jersey.

— torta n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, pp. 152, 153 [pl. 20], fig. 36. Phila., 1862-1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, and near Mullica Hill, New Jersey.

Bivonia (Gray) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 302. Phila., 1876. Wm. M. Gabb.

— ? cretacea n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 302. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia.

Bothriopygus alabamensis n. s. Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Balto., 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Alabama.

Bourgueticrinus alabamensis n. s. De Loriol (1882.)

Jour. Cincinnati Soc. Nat. Hist., vol. 5, p. 118, pl. 5, figs. 1, 1a-c. Cincinnati, 1882. P. De Loriol.

Formation: Cretaceous.

Location: Livingston, Alabama.

Brachydontes (subgen. Swainson) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 70. Wash., 1876. F. B. Meek.

Brachymeris n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 6. T. A. Conrad.

— alta n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 6, pl. 1, fig. 16; pl. 2, fig. 23. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Brachysphingus n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 155, 156. Phila., 1869. W. M. Gabb.

— liratus Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 156. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

Brachysphingus—Continued.**— sinuatus n. s. Gabb. (1869.)**

Geol. Sur. Cal., Paleont., vol. 2, p. 156, pl. 26, fig. 35. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Breviarca n. subgen. Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 55. Phila., 1872. T. A. Conrad.

— saffordi (Gabb.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 87, 88, pl. 12, figs. 11, 12. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

Bucardia [Schum.] Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 41, Phila., 1870. T. A. Conrad.

— veta n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 41, pl. 1, fig. 2. Phila., 1870. T. A. Conrad.

Formation: Eocene. [Cretaceous.]

Location: Shark river, New Jersey.

Buchiceras (Hyatt) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of 100th meridian, vol. 4, pt. 1, p. 202. Wash., 1875. C. A. White.

— ? cornutum n. s. Whiteaves. (1884.)

Proc. and Trans. Roy. Soc. Canada, vol. 2, sec. 4, pp. 239, 240. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Fort St. John, on the Peace river.

— swallowi (Shum.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of 100th meridian, vol. 4, pt. 1, pp. 202, 203, pl. 20, figs. 1 a-c. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Glendale, Long valley, Utah.

Buccinopsis n. g. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 158. Wash., 1857. T. A. Conrad.

— ? conradi n. s. Hill. (1888.)

Ann. Rep. Geol. Sur. Ark. for 1888, vol. 2, pp. 130, 131, pl. 3, figs. 2, 2a. Little Rock, 1888. R. T. Hill.

Formation: Cretaceous.

Location: Upper part of the gypsum bluffs of the Little Missouri river, Arkansas.

— parryi n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 158, pl. 13, figs. 4a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Between Rio San Pedro and Rio Puercos.

Buccinum (Linn.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 96. Phila., 1864. W. M. Gabb.

— bicarinatum (Goldf.) Eichwald. (1871.)

Geog., Paleont., Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 117, 118.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

Buccinum—Continued.— **constrictum** H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 411.
Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.

— **liratum** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 96, pl. 28, fig. 211. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Clayton, and Marsh's ranch, Contra Costa county, Cal.

— **? nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 67.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau and Fox hills, Nebraska, [S. Dak.].

— **? vinculum** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 390, 391, pl. 3, figs. 5a, b. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Great Bend [of the Missouri river].

Bulimina (d'Orb.) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsber. 1861, Band XLIV, p. 338, Wien, 1862. A. E. Reuss.

— **tortilis** n. s. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsber. 1861, Band XLIV, p. 338, Taf. viii, fig. 3, Wien, 1862. A. E. Reuss.
Formation: Cretaceous.
Location: New Jersey.

— **sp. undet.** Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsber. 1861, Band XLIV, p. 338, Wien, 1862. A. E. Reuss.
Formation: Cretaceous.
Location: New Jersey.

Bulimnea (subgen. Haldeman) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 532. Wash., 1876. F. B. Meek.

Bulimus *limneaformis* n. s. (M. & H.). (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 118. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Clark [N. Dakota].

— **nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 118. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Clark [N. Dakota].

— **? teres** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 117, 118. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union [N. Dakota].

Bulimus—Continued.— **? vermiculus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 118. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union [N. Dakota].

Bulinus (O. F. Müller) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 540. Wash., 1876. F. B. Meek.

— **atavus** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 86, pl. 24, figs. 5a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of Dog creek, a tributary of the Upper Missouri river.

— **atavus** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 450, pl. 25, figs. 6, 7. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of Dog creek.

— **disjunctus** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 170. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Crow Creek valley, Colorado.

— **disjunctus** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Evanston coal mines, Wyoming.

— **disjunctus** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 86, 87, pl. 24, figs. 6a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of Crow creek, northern Colorado, about 10 miles above the confluence of that creek with Platte river.

— **disjunctus** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 451, pl. 25, figs. 4, 5. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: East of the Rocky mountains, in Colorado.

— **longiusculus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 541, 542, pl. 43, figs. 16a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Three miles below Fort Union, N. Dakota.

— **longiusculus** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Evanston coal mines, Wyoming.

— **longiusculus** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 87. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Fort Union, on the upper Missouri river.

Bulinus—Continued.— **longiusculus** (M. & H.) White. (1880.)

Third Ann. Rep. U. S. Geol. Sur., p. 451, pl. 25, fig. 8. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Union, N. Dakota.

— **? rhomboideus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 542, pl. 43, fig. 17. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Three miles below Fort Union, N. Dakota.

— **? rhomboideus** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 87. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Union on the upper Missouri river.

— **rhomboideus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 451, pl. 25, fig. 9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Union, N. Dakota.

— **subelongatus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 540, 541, pl. 42, figs. 13a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, on the Missouri, in Montana.

— **subelongatus** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 170, 171. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— **subelongatus** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Mellis Station, Wyoming.

— **subelongatus** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 87. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri River region.

— **subelongatus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 450, pl. 25, figs. 10, 11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Mouth of Judith river, Montana.

Bulla (Linn.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46. Phila., 1834. S. G. Morton.

Bulla—Continued.— **hornii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 143, pl. 29, fig. 235. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

— **macrostoma** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 301, 302, pl. 48, fig. 16 [15]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

— **minor** n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 69. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau trading post [S. Dakota].

— **mortoni** n. s. Forbes. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, p. 63, fig. a. London, 1845. Edward Forbes.

Formation: Cretaceous.

Location: New Jersey.

— **occidentalis** n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 69. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river.

— **recta** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 302, pl. 48, fig. 17 [16]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, New Jersey.

— **subcylindrica** n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 270. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Near mouth of Milk river, Nebraska [Montana].

— **volvaria** n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 69. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau trading post, [S. Dakota].

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Alabama.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **? Morton.** (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 282. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: [New Jersey?]

Bullia (Gray) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 156. Phila., 1869. W. M. Gabb.

— (**Molopophorus**) **striata** n. s., Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 157, pl. 26, fig. 36. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

Bullopsis n. g. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d. ser., 1855-1858, p. 334. Phila., 1855-1858. T. A. Conrad.

— **cretacea** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d. ser., 1855-1858, p. 334. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, 3 miles north of the town of Ripley, Miss.

Busycon ? **blakei** n. s. Conrad. (1855.)

Rep. Expl. and Sur. R. R. R., Miss. River to Pacific ocean, App. Prelim., Geol. Rep. of W. P. Blake, Pal., p. 11. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— ? **blakei** Conrad. (1856.)

Rep. Expl. and Sur. R. R. R., Miss. River to Pacific ocean, vol. 5, App., p. 322, pl. 2, fig. 13. Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

Callianassa (Leach) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 57. Phila., 1864. W. M. Gabb.

— **antiqua** (Otto) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 241, 242. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Middletown, New Jersey.

— **danai** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., n. s., vol. 5, pp. 379, 380, pl. 1, figs. 1a, b. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Great Bend of the Missouri.

— **stimpsonii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 57, pl. 9, figs. 1a-c. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Chico creek; Clayton, Contra Costa county; Near Cañada de las Uvas, California.

— **stimpsonii** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 127, pl. 19, fig. 3. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

— **ulrichi** n. s. White. (1880.)

Proc. U. S. Nat. Mus., vol. 3, pp. 161, 162, Wash., 1880, Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Formation: Cretaceous [Tertiary].

Location: Near Little Rock, Arkansas.

Callianassa—Continued.— **ulrichi** White. (1881.)

Proc. U. S. Nat. Mus., vol. 4, p. 137, pl. 1, figs. 10 and 11. Wash., 1881, Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Callista (Poli) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-1860, p. 282. Phila., 1858-1860. T. A. Conrad.

— (Poli) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 178. Wash., 1876. F. B. Meek.

— **delawarensis** (Gabb) Whitfield, (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 153, 154, pl. 22, figs. 8-10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold, Marlboro, and Holmdel, New Jersey.

— **deweyi** M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 443. Phila., 1862. Meek & Hayden.

Formation: Cretaceous.

Location: Deer creek, a tributary of the north branch of Platte river, Nebraska.

— **deweyi** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 183. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Little Thompson creek and Fossil ridge, Colorado.

— **eufaulensis** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-1860, p. 282, pl. 46, fig. 24. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Alabama.

— ? **pellucida** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 187, 188, pl. 17, figs. 10a-e, 12a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Two hundred miles above the mouth of Milk river [Montana].

— (?) **subtrigona** n. s. Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 63, 64, pl. 9, fig. 10. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte Islands.

— (**Aphrodina** ?) **tenuis** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 188, 189, pl. 5, figs. 1a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: South fork of Cheyenne river, near the base of Black hills.

— (**Dosiniopsis** ?) **orbiculata** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 186, 187, pl. 5, figs. 2a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Five miles below the mouth of James river [S. Dakota].

Callista—Continued.— (*Dosiniopsis*) *owenana* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 183, 184, pl. 37, fig. 1. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river [Montana].

— (*Dosiniopsis*) *nebrascensis* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 184-186, figs. 15-17, p. 184. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On Cheyenne and Moreau rivers; Deer creek, on the North Platte river [S. Dakota].

— (*Dosiniopsis?*) *deweyi* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 182, 183, pl. 17, figs. 15a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, and on the Yellowstone river.

— (*Dosiniopsis*) *deweyi* (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont., vol. 1, pt. 1, pp. 42, 43, pl. 6, figs. 4, 5, 5a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bull's Head, about twenty-two miles west of the west end of the Cypress hills; hills south of Big Plume creek, township 8, range 5, west of 4th principal meridian, Canada.

— (?) sp. undet. Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 64, 65, pl. 9, fig. 11. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

Calliostoma (Swains.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 170. Phila., 1869. W. M. Gabb.

— *constrictum* n.s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 217, pl. 28, figs. 4, 4a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud island, opposite Leading island.

— *radiatum* n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 170, 171, pl. 28, fig. 53. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county, Cal.

Calloarca (subgen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 78. Wash., 1876. F. B. Meek.

Callonema n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 12. T. A. Conrad.

Callonema—Continued.— *bella* n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 12. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— *carolinensis* n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A, p. 12, pl. 2, fig. 27. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Calobates (subgen. Gould) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 261. Wash., 1876. F. B. Meek.

Camæna (subgen. Albers) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 550. Wash., 1876. F. B. Meek.

Campeloma (Raf.) Meek. (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, p. 179. Wash., 1877. F. B. Meek.

— *macrospira* Meek? (1877.)

Rep. Geol. Expl. 40th parallel, vol. 4, pt. 1, pp. 179-180, pl. 17, figs. 17a, b. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river, Wyoming.

— *macrospira* (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 245-246. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, Wyoming.

— *macrospira* (Meek) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 102, pl. 30, fig. 2a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, southwestern Wyoming.

— *macrospira* (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 469, pl. 8, figs. 6-7. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming.

— *multilineata* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 586, 587, pl. 44, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Clarke, N. Dakota, on the Missouri.

— *multilineata* (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 101. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Campeloma—Continued.**— multilineata (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 469, pl. 27, figs. 1-7. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Clarke, in the valley of the Upper Missouri.

— multilineata (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont. vol. 1, pt. 1, p. 77. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, east side of Driftwood bend, and South Saskatchewan, six miles below the mouth of Bow river; north side of Milk river, five miles below Pā-kow-kī coulée, Canada.

— multistriata (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 588, 589, pl. 43, figs. 15a-e, fig. 80, p. 588. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Clarke, N. Dakota, on the Missouri river; near mouth of Yellowstone river, Montana.

— multistriata (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 173. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— multistriata (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 221, 222. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— multistriata (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, p. 101. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— multistriata (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 469, pl. 27, fig. 15. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Clarke, in the valley of the Upper Missouri.

— producta n. s. White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 97, pl. 3, figs. 7-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Yellowstone river, Montana.

— producta (White). (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 469, pl. 26, figs. 21-27. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of the Yellowstone river.

— producta (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 24. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Three Hills creek, township 30, range 23, west of 4th principal meridian, Canada.

Campeloma—Continued.**— producta (White) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 28. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Wood End depot, Souris river, and "Great Valley," about one hundred miles west of Wood End, on the 49th parallel; Short creek, Souris river, Canada.

— producta (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 77. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, one mile below the mouth of Bow river, Canada.

— vetula (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 587-588, pl. 44, figs. 14a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Montana.

— vetula (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 210. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Cañon park, Colorado.

— vetula (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 221. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— vetula (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 216. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Point of Rocks station, Wyoming.

— vetula (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, p. 101. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— vetula (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 469, pl. 27, figs. 8-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region; Black Buttes, Wyoming.

Campeloma sp. undet. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 181, pl. 17, figs. 15a, b, and 16a-c. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river, Wyoming.

— (Melantho) macrospira n. s. Meek. (1871.)

Proc. Acad. Nat. Sci., Phila., for 1871, pp. 181-182. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Gilmore, Wyo.; Bear river, near the mouth of Sulphur creek, Utah [Wyoming]; various localities in the Bear river country.

Campeloma—Continued.— (**Melantho**) **macrospira** Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 180-181. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river, Wyoming.

Camptonectes n. g. Agassiz MS. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 39. Wash., 1864. F. B. Meek.

— **argillensis** Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

— **bellisculptus** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99, pl. 9, fig. 11. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **bellistriatus**. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 39. Wash., 1864. F. B. Meek.

Formation: Jurassic.

Location: Idaho.

— **bellistriatus** (Meek) M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 77, 78, figs. a-d, text. Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Red Buttes and below there on the north branch of Platte river, Dakota [Wyoming].

— **bellistriatus** (M. & H.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of one hundredth Meridian, vol. 4, pt. 1, p. 165. Wash., 1875. C. A. White.

Formation: Jurassic.

Location: Five miles east of Gunnison, Utah.

— **bellistriata** Meek. (1876.)

Rep. Expl. Great Basin Terr. Utah, pp. 356, 357, pl. 3, figs. 3a-d. Wash., 1876. F. B. Meek.

Formation: Jurassic.

Location: Near the Red Buttes, on the North Platte [Wyoming].

— **bellistriatus** (Meek) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 289-290, pl. 7, fig. 13. Wash., 1877. Hall & Whitfield.

Formation: Jurassic.

Location: Northwest of Rawlings station, Wyoming, and from Sheep creek, and Flaming Gorge, Uinta range, Utah.

— **bellistriatus** (Meek) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 351-353, pl. 4, figs. 6-11. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Near Bear Lodge, on the Belle Fourche river; on Spearfish creek; in Redwater valley, and in the Big Horn mountains.

Camptonectes—Continued.— **burlingtonensis** (Gabb) Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 76. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

— **burlingtonensis** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 318. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **curvatus** (Geinitz) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss, vol. 1, pt. 3, p. 242, pl. 32, fig. 4. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud Island.

— ? **extenuatus** (M. & H.) (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 78, pl. 3, fig. 6. Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: North Platte, below Red Buttes, Dakota [Wyoming]; and southwest base of Black Hills.

— **extenuatus** (Meek) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 290, 291, pl. 7, fig. 18. Wash., 1877. Hall & Whitfield.

Formation: Jurassic.

Location: Northwest of Rawlings station, Wyoming.

— ? **extenuatus** (M. & H.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser. No. 7, pp. 401, 402. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— ? **extenuatus** (M. & H.) Whiteaves. (1878.)

Geol. Sur. Canada; Rep. Prog., for 1876-'77, pp. 151, 152. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

— **extenuatus** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black hills of Dakota, pp. 353, 354, pl. 4, figs. 4, 5. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near Bear Lodge, Black hills.

— **pertenuistriatus** n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 291, 292, pl. 7, fig. 17. Wash., 1877. Hall & Whitfield.

Formation: Jurassic.

Location: Northwest of Rawlings station, Wyoming.

Camptonectes—Continued.— **platessa** n. s. White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur., West of 100th Merid., G. M. Wheeler, p. 25. Wash., 1874. C. A. White.

Formation: Cretaceous.

Location: Fifty miles north of Camp Apache and five miles west of Mineral Spring, Arizona.

— **platessa** White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th Meridian, vol. 4, pt. 1, p. 176, pl. 17, fig. 5a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Fifty miles north of Camp Apache and five miles west of Mineral Spring, Arizona.

— **platessiformis** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 143, 144, pl. 37, fig. 5a. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Aquarius plateau, southern Utah.

— **parvus** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 55, pl. 8, figs. 1 and 2. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold, New Jersey.

— **stygus** n. s. White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur. west of 100th Merid., G. M. Wheeler, p. 23. Wash., 1874. C. A. White.

Formation: Jurassic.

Location: "Edge of the bluff, fifteen to twenty miles south of Dirty Devil river and upon the north fork of Virgin river, Utah."

— **stygus** White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of 100th Meridian, vol. 4, pt. 1, pp. 164-165, pl. 13, figs. 2a-c. Wash., 1875. C. A. White.

Formation: Jurassic.

Location: East of Aquarius plateau, fifteen to twenty miles south of Dirty Devil river, and also at the North fork of Virgin river, Utah.

— (**Amusium**) **burlingtonensis** (Gabb) Whitfield. (1884.)

Mon. U. S. Geol. Sur., vol. 9, pp. 53-55, pl. 8, figs. 3-9. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield and Holmdel, New Jersey.

— ? **sp. undet.** Whiteaves. (1877.)

Geol. Sur. Can.; Rep. Prog. for 1875-1876, app. II, p. 96. Montreal, 1877. J. F. Whiteaves.

Formation: Jurassic or Cretaceous.

Location: Rock Island gates, below Hudson's Hope, Peace river.

Cancellaria (Lam.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 390. Phila., 1858-1860. Wm. M. Gabb.

— **alabamensis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301, pl. 48, fig. 14. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

Cancellaria—Continued.— **eufaulensis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 390, 391, pl. 68, fig. 8. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Alabama.

— **septemlirata** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94, pl. 2, fig. 10. Phila., 1861. Wm. M. Gabb.

Formation: Cretaceous.

Location: Mullica Hill, New Jersey.

— **subalta** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 100, pl. 9, fig. 22. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, New Jersey.

— **turneri** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 25, pl. 3, figs. 6 and 7. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Martinez, Contra Costa county, Cal.

Cancer (Linn.) Morton. (1830.)

Am. Jour. Sci., 1st. ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st. ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 74. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Sandy Hook [N. J].

Candona? **emmonsii** n. s. Jones. (1862.)

Paleontographical Society, pp. 125-126, fig. 12, in text. London, 1862. T. R. Jones.

Formation: Triassic?

Location: Phoenixville, Pa.

— ? **rogersii** n. s. Jones. (1862.)

Paleontographical Society, pp. 124, 125, pl. 5, figs. 20-22. London, 1862. T. R. Jones.

Formation: Triassic?

Location: Culpeper and Prince Edward counties, Virginia; Deep river, North Carolina; Phoenixville, Pa.

Cantharus subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 378. Wash., 1876. F. B. Meek.

Cantharus (Bolten) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 377-379. Wash., 1876. F. B. Meek.

— ? **julesburgensis** n. s. White. (1881.)

Proc. U. S. Nat. Mus., vol. 4, p. 138, pl. 1, figs. 1 and 2, Wash., 1881, Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Formation: Cretaceous.

Location: Vicinity of Julesburg, Colo.

Cantharus—Continued.**— (Cantharus) vaughani (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 379, 380, pl. 32, figs. 5a, b, fig. 48, p. 379. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the mouth of Heart river, on the Upper Missouri.

Canthyria (subgen. Swain.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Caprina (d'Orb.) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 268. Phila., 1856. T. A. Conrad.

— crassifibra n. s. Roemer. (1849.)

Texas, pp. 408, 409. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Near Waco camp, above New Braunfels, and on Pedernales and San Saba rivers, Texas.

— crassifibra Roemer. (1852.)

Kreide. von Texas, p. 79, Taf. 5, figs. 6a-f. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp on the Guadalupe, above New Braunfels, upper course of Pedernales river, and San Saba valley, Texas.

— guadalupae n. s. Roemer. (1849.)

Texas, p. 408. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, above New Braunfels, Tex.

— guadalupae Roemer. (1852.)

Kreide. von Texas, pp. 79, 80, Taf. 5, figs. 4a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, on the Guadalupe, above New Braunfels, Tex.

— occidentalis n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 268. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Near the mouth of Puercos river, Texas.

— occidentalis Con. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 147, pl. 2, fig. 1-ac. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Near the mouth of Puercos river.

— planata n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 268. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Oak creek, near Puercos [Texas].

— planata Con. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 147, pl. 2, figs. 2a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Oak creek, near Puercos.

Caprina—Continued.**— quadrata n. s. Conrad. (1855.)**

Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 266.

Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama.

— ? texana n. s. Roemer. (1849.)

Texas, p. 409. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Near Waco camp, slope of plateau near Braunfels and on road from New Braunfels to Fredericksburg, Tex.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429.

Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Mission Station, N. P. R. R.

Caprinella coraloidea n. s. H. & M. (1854.)

Mem. Am. Acad. Arts. and Sci., n. s., vol. 5, pp. 380-381, pl. 2, figs. 3a-f. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek, Nebr.

Caprotina (d'Orb.) Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, p. 126. Wash., 1876. F. B. Meek.

— texana Roemer. (1852.)

Kreide. von Texas, p. 80, Taf. 5, figs. 2a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Highlands between New Braunfels and Fredericksburg, Tex.

— texana (Roem.) Marcou. (1858.)

Geol. N. Am. p. 42. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Hills surrounding Comet creek, on the left bank of the False Washita.

— (Requienia ?) bicornis n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, p. 126, pl. 1, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Lancaster, Texas.

Capsa (Lam.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 164. Wash., 1857. T. A. Conrad.

— texana n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 164, pl. 21, fig. 6. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon Springs [Texas].

Capulus fragilis n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Fox hills, Nebraska [S. Dakota].

Capulus—Continued.— **occidentalis** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 385, 386, pl. 1, figs. 13a-d. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek, Nebraska [Wyoming].

Cardiaster (Forbes) d'Orb.

Paleont. Française, Echinoides Irreguliers, Terr. Crét., t. 6, pp. 123, 124. Paris, 1853-1860. A. d'Orbigny.

— (Forbes) Desor. (1858.)

Synop. Echinides Foss., p. 344. Paris and Wiesbaden, 1858. E. Desor.

— **cinctus** (Mort.) d'Orb. (1854.)

Paleont. Française Echinoides Irreguliers, Terr. Crét., t. 6, p. 147, pl. 905, fig. 4. Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: New Jersey.

— **cinctus** (Morton) Desor. (1858.)

Synop. Echinides Foss., p. 346. Paris and Wiesbaden, 1858. E. Desor.

Formation: Cretaceous.

Location: New Jersey.

— **fimbriatus** (Mort.) d'Orb. (1854.)

Paleont. Française Echinoides Irreguliers, Terr. Crét., t. 6, pp. 146, 147, pl. 905, fig. 3. Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: New Jersey.

Cardinia (Agass.) Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 13. Phila., 1870. Wm. M. Gabb.

— ? **ponderosa** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 13, pl. 6, fig. 11, 11a. Phila., 1870. Wm. M. Gabb.

Formation: Triassic.

Location: New pass, near Austin [Nevada].

— **praecisa** n. s. White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, pp. 149, 150, pl. 37, figs. 7a, b. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Near the lower cañon of Yellowstone river, Montana.

— ? **triangularis** n. s. Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, p. 179, Taf. 16, figs. 21, 22. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— ? **sp. undet.** Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 428. Phila., 1871. F. B. Meek.

Formation: Jurassic.

Location: Salinas creek, Hot Springs.

Cardita (Brug.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66. Phila., 1834. S. G. Morton.

Cardita—Continued.— ? **alticosta** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont. vol. 2, p. 268, pl. 36, fig. 16. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— **decisa** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 292 (pl. 9, fig. 3, [vol. 24]). New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: St. Georges, Del.

— **decisa** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 3. New Haven, 1833. S. G. Morton.

[Described in vol. 23.]

— **decisa** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66, pl. 9, fig. 3. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: St. Georges, Del.

— **eminula** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 150, pl. 6, fig. 8. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon springs [Texas].

— **hornii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 174, pl. 24, fig. 157. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Martinez, near Clayton, Cal.

— **hornii** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 187, 188, pl. 30, figs. 83, 83a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon; Martinez; Clayton; near New Idria, and west of Griswold's, on the road from the latter place to San Juan, Cal.

— **intermedia** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 209, pl. 28, figs. 14, 15. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Farmingdale, N. J.

— **planicosta** (Lam.) Conrad. (1855.)

Rep. Expl. and Sur. P. R. R. Miss. River to Pacific Ocean. App. Prelim. Geol. Rep. of W. P. Blake, Pal., p. 10. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas [California].

— **planicosta** (Lam.) Conrad. (1856.)

Rep. Expl. and Sur. P. R. R. Miss. River to Pacific Ocean, vol. 5, App. p. 321, pl. 2, fig. 6. Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Canada de las Uvas.

— **subtetrica** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 164, pl. 21, fig. 5. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Rio Bravo del Norte [Texas].

Cardita—Continued.— **subquadrata** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d. ser., 1858-1860, p. 303, pl. 48, fig. 22a, b. [21a, b]. Phila. 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, New Jersey.

— **subquadrata?** Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 395. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tennessee.

Cardium (Linn.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66. Phila., 1834. S. G. Morton.

— (Linn.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 166. Wash., 1876. F. B. Meek.

— **abruptum** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 302. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: "Near Purdy," Tenn.

— **arcaiformis** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 11, 12, pl. 3, fig. 9. Phila., 1870. Wm. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nevada.

— **arkansense** n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 266. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Arkansas.

— **bellulum** n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, New Mexico, to junction of Grand and Green rivers, pp. 128-129, pl. 2, figs. 6a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Rio de la Plata [Colorado].

— **brazoense** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 600. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Johnson county, at Comanche Peak, a few feet above the level of Brazos river, and near Patrick's creek, Parker county, Texas.

— **brewerii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 175, pl. 24, fig. 155. Phila., 1864. Wm. M. Gabb.

Formation: Cretaceous.

Location: East of the north end of Cañada de las Uvas; around Martinez, Cal.

— **choctawense** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 599. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Post-Oak creek, Grayson county, Texas.

Cardium—Continued.— **choctawense** (Shumard) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 39, pl. 18, figs. 7a-c. Wash., 1883. C. A. White.

— **coloradoense** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 599, 600. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Burnet, Travis, Bosque, Johnson, and McLennan counties, and several hundred miles further westward, Texas.

— **congestum** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 149, pl. 6, figs. 5a-d. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Rio San Pedro [Texas].

— **cooperii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 172, pl. 24, figs. 154, 154a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, San Diego, near Cañada de las Uvas, Cal.

— **cooperi** (Gabb) Eichwald. (1871.)

Geog. Paleont. Bemerck. Halbins. Mang. u. Aleutischen Inseln, p. 176, Taf. 16, figs. 3, 4. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— **curtum** (M. & H.?) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 151, 152, pl. 15, fig. 3 (not 3a). Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Chalk creek, two miles west of Uptown, Utah.

— **curtum** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **curtum** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 249. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Hilliard station, Wyoming.

— **decoratum** (Grew.) Eichwald. (1871.)

Geog. Paleont. Bemerck. Halbins. Mang. u. Aleutischen Inseln, pp. 129, 130. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula, Kadiak, Unga, and Atcha islands.

— **dumosum** n. s. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 75. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **elegantulum** n. s. Roemer. (1849.)

Texas, pp. 405, 406, Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall, near New Braunfels, Tex.

Cardium—Continued.— **elegantulum** Roemer. (1852.)

Kreide. von Texas, pp. 48, 49, Taf. 6, figs. 5a-c.
Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

— **eufaulense** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 282, pl. 46, fig. 12. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss., and Eufaula, Ala.

— **eufaulensis** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 132, pl. 20, figs. 17-19. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, N. J.

— **guerangeri** (d'Orb.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 128, 129. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— **hemicyclicus** n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila. 1856. M. Tuomey.

Formation: Cretaceous.

Location: Alabama.

— **hillanum** (Sow.) Roemer. (1849.)

Texas, p. 406. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg and San Saba river, Texas.

— **hillanum** (Sow.) Roemer. (1852.)

Kreide. von Texas, p. 49, Taf. 6, fig. 12. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg and San Saba valley, Texas.

— **inbricatarium** (Leym.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 175, 176. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— **kansasense** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 307, 308. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Saline county, Kansas.

— ? **kansasense** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 170, 171, pl. 2, figs. 14a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

Cardium—Continued.— **kansasense** (Mk.) Cragin. (1889.)

Bull. Washb. Col. Lab. Nat. Hist., vol. 2, No. 10, p. 67. Topeka, 1889. F. W. Cragin.

Formation: Cretaceous.

Location: Kiowa, Comanche, Bavaria, and Ellsworth counties, Kansas.

— **lamarensis** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 600, 601. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Lamar county, Texas.

— **lindeum** n. s. Conrad. (1855.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean, App. Prelim. Geol. Rep. of W. P. Blake, Pl. p. 9. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— **lindeum** Conrad. (1856.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean, vol. 5, App., p. 320, pl. 2, fig. 1. Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— **mediale** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 149, pl. 4, figs. 4a-b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location:— [Texas].

— **multistriatum** n. s. Shumard. (1853.)

Expl. Red river, Louisiana, by R. B. Marcy, p. 207, pl. 4, fig. 2. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Camp No. 4, Cross Timbers, Tex.

— **multistriatum** (Shum.) Schiel. (1855.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean, vol. 2; Rep. Expl. Forty-first Parallel N. Lat., p. 109, pl. 1, fig. 10. Wash., 1855. James Schiel.

Formation: Cretaceous.

Location: Upper Green river.

— **multiradiatum** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 395, pl. 68, fig. 29. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **pauperculum** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 306. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Oil Springs, twenty miles west of Fort Bridger, Wyo.

— **pauperculum** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 291, pl. 9, fig. 3a. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Oil Springs, twenty miles west of Fort Bridger, Wyo.

Cardium—Continued.

- *pedernalis* n. s. Roemer. (1849.)
Texas, p. 406, Bonn., 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- *pertenue* n. s. M. & H. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 442.
Phila., 1862. Meek & Hayden.
Formation: Cretaceous.
Location: Deer creek, near the north branch of Platte river, Nebraska [Wyoming].
- *protectum* n. s. Conrad. (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 12. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Burlington county, New Jersey.
- *remondianum* n. s. Gabb. (1864.)
Geol. Sur. Cal., Palaeont., vol. 1, p. 172, pl. 23, fig. 153. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Benicia, "Wright's Gulch," near Shasta City, Cal.
- *ripleyanum* n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 96, pl. 9, fig. 6. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- *ripleyanum* (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 132, 133, pl. 20, fig. 14. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Keyport, N. J.
- *ripleyense* n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- *rarum* n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 39. St. Louis, 1856-1860. Evans & Shumard.
Formation: Cretaceous.
Location: On Moreau and Grand rivers [S. Dakota].
- ? *sancti-sabæ* n. s. Roemer. (1849.)
Texas, p. 405. Bonn., 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and old Spanish fort on San Saba river, Texas.
- *sancti-sabæ* Roemer. (1852.)
Kreide. von Texas, p. 48, Taf. 6, figs. 7a, b. Bonn., 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and Spanish fort on San Saba river, Texas.
- *scitulum* n. s. Meek. (1858.)
Trans. Albany Inst., vol. 4, pp. 40, 41. Albany, 1858-1864. F. B. Meek.
Formation: Cretaceous.
Location: Nanaimo, Vancouver island.

Cardium—Continued.

- ? *sevieriensis* n. s. Hill. (1888.)
Ann. Rep. Geol. Sur. Ark. for 1888, vol. 2, pp. 134, 135, pl. 2, figs. 21, 21a. Little Rock, 1888. B. T. Hill.
Formation: Cretaceous.
Location: Near Murfreesboro, Ark.
- *shumardi* n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 182, 183. Phila., 1861. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills, Nebraska [Wyoming].
- *speciosum* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 274, 275. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Bad Lands of Judith river, Nebraska [Montana].
- *speciosum* (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 182, 183. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge; mouth of St. Vrain creek; valleys of the Cache à la Poudre and Little Thompson creeks, Colorado.
- *speciosum* (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- *speciosum* (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 225. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near White River Indian agency, Colorado.
- *speciosum* (M. & H.?) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 229. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Dodd's ranch on Ashley's fork, Utah.
- *spillmani* n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326, pl. 34, fig. 3. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of town of Ripley, Miss.
- *subcurtum* Meek. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1, pp. 152, 153, pl. 15, fig. 3a (not fig. 3). Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: Chalk hill, near Coalville, Utah; between Coalville and Weber Canon.
- *subcurtum* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

Cardium—Continued.

- **subcurtum** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 250. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyo.
- **subquadratum** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp.
38, 39. St. Louis, 1856-1860. Evans & Shu-
mard.
Formation: Cretaceous.
Location: Moreau river [S. Dakota].
- **tippanum** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 326, pl. 34, fig. 8b. Phila., 1855-1858.
T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.
- **transversale** n. s. Roemer. (1849.)
Texas, p. 406. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **trite** n. s. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 291, 292, pl. 5, figs. 4a, b. Wash., 1879.
C. A. White.
Formation: Cretaceous.
Location: Head of Waterpocket cañon, southern
Utah.
- **trite** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 248. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear River valley, Wyoming.
- **tumidulum** n. s. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1,
pt. 3, pp. 249, 250, pl. 33, fig. 4. Montreal, 1884.
J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Maud island.
- (**Adacna**)? sp. undet. White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 58, pl. 9, fig. 4.
Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Palace Camp, Washington.
- (**Criocardium**) **dumosum** (Con.)
Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 133-135, pl. 20,
figs. 9-13. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- (**Criocardium**) **multiradiatum**
(Gabb.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 135, 136, pl. 21,
figs. 1-3. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel, Monmouth, Freehold, and
Burlington, N. J.
- (**Criocardium**) **speciosum** (M. &
H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 169, 170, pl.
37, figs. 4a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river; on Cache La
Poudre river, Colorado.

Cardium—Continued.

- (**Granocardium**) **sabulosum** n. s.
Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 267, pl. 36, fig. 14.
Phila., 1869. Wm. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi,
Sonora, Mexico.
- (**Granocardium**) **tippanum** (Con.)
Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 310.
Phila., 1876. Wm. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Georgia.
- (**Hemicardium**?) **curtum** n. s. M.
& H. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 442.
Phil., 1862. Meek & Hayden.
Formation: Cretaceous.
Location: Head Gros Ventres river, Nebraska
[Wyoming].
- (**Lævicardium**) **annulatum** n. s.
Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 171, pl. 23, fig.
152. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Curry's, south side of Mount Diablo,
California.
- (**Lævicardium**) **annulatum** Gabb.
(1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 187, pl. 30, fig.
81. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, south of Mount Diablo, and
in Orestimba cañon, California.
- (**Protocardium**) **filosum** n. s. Con-
rad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 150,
pl. 6, figs. 7a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Leon Springs, Texas.
- (**Protocardium**) **granuliferum** n. s.
Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 267, 268, pl.
36, fig. 15. Phila., 1869. Wm. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi,
Sonora, Mexico.
- (**Protocardia**) **linteum** n. s. Con-
rad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, pp. 278, 279, pl. 46, fig. 17. Phila., 1858-
1860. T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula [Alabama]; Tippah county,
Alabama [Mississippi].
- (**Protocardia**) **multistriatum**
(Shum.) Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
149, pl. 6, figs. 4a-c. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Leon Springs [Texas].

Cardium—Continued.— (**Protocardium**) *perelongatum* n. s.
Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 136-138, pl. 20,
figs. 20, 21, pl. 21, figs. 4, 5. Wash., 1885. R.
P. Whitfield.

Formation: Cretaceous.

Location: Cream Ridge and Mullica Hill, New
Jersey.

— (**Protocardium**) *placerensis* n. s.
Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 173, pl. 24, fig.
156. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county, California.

— (**Protocardia**) *salinaense* n. s. Meek.
(1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 306, 307. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Sa-
line county, Kansas.

— (**Protocardia**) *texanum* n. s. Con-
rad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
150, pl. 6, figs. 6a-c. Wash., 1857. T. A. Con-
rad.

Formation: Cretaceous.

Location: Between El Paso and Frontera.

— (**Protocardium**) *translucidum* n. s.
Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 187, pl. 30,
figs. 82, 82a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, south of Mount Diablo, Cali-
fornia.

— (**Trachycardium**) *alabamense* n. s.
Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 310.
Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

— (**Trachycardium**) *carolinensis* n. s.
Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1; Raleigh, 1875,
W. C. Kerr, App. A, p. 7, pl. 2, fig. 1. T. A.
Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Caro-
lina.

— (**Trachycardium**) *carolinense*
(Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 310.
Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia.

— (**Trachycardium**) *eufaulense* (Con.)
Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 310.
Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Quitman county, Georgia.

BULL. 102—6

Cardium—Continued.

— sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 285. New
Haven, 1830. S. G. Morton.

Formation: Cretaceous.

— sp. undet. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66. Phila.,
1834. S. G. Morton.

Formation: Cretaceous.

— sp. undet. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66. Phila.,
1834. S. G. Morton.

Formation: Cretaceous.

— sp. undet. Roemer. (1849.)

Texas, p. 406. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— sp. undet. Roemer. (1849.)

Texas, p. 406. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford near New Braunfels, Tex.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 50. Bonn, 1852. F. Roe-
mer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 49. Bonn, 1852. F. Roe-
mer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 49. Bonn, 1852. F. Roe-
mer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, New Braun-
fels, Tex.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 50. Bonn, 1852. F. Roe-
mer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— sp. undet. Owen. (1860.)

Second Rep. Geol. Rec. Arkansas, pl. 7, fig. 2.
Phila., 1860. D. D. Owen.

Formation: Cretaceous.

Location: Arkansas.

— sp. undet. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 292, pl. 9, figs. 2a-c. Wash., 1879.
C. A. White.

Formation: Cretaceous.

Caryatis (Roem.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 185, 186.
Phila., 1869. W. M. Gabb.

— *nitida* Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 186, pl. 30,
fig. 79. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Caryatis—Continued.— **subtrigona** Whiteaves. (1884.)

Geol. and Nat. Hist., Sur. Can.: Mes. Foss., vol. 1, pt. 3, p. 226. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet; south side of Alliford bay, Queen Charlotte islands.

— ? **veta** n. s. Whitfield. (1884.)

Mon. U. S. Geol. Sur., vol. 9, pp. 218, 219, pl. 28, figs. 16-19. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.

Location: Farmingdale, Squankum, New Egypt, and at Shark river, New Jersey.

Caryophyllia (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton

— **egeria** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 275, pl. 6, figs. 7a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: [Cimarron, N. Mex.]

— **egeria** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 205. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colorado.

— **johannis** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 274, 275, pl. 6, figs. 6a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Cimarron, N. Mex.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.

Formation: [Cretaceous.]

Location: Gloucester county, New Jersey.

Cassianella (Beyrich) Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 14. Phila., 1870. Wm. M. Gabb.

— **lingulata** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 14-15, pl. 5, figs. 13-13a, b. Phila., 1870. Wm. M. Gabb.

Formation: Triassic.

Location: Star cañon, Nevada.

Cassidulus (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 76. Phila., 1834. S. G. Morton.

— **abruptus** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 291. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Mississippi.

— **æquoreus** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 76, pl. 3, fig. 14. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie bluff, Alabama.

Cassidulus—Continued.— **æquoreus** (Morton) D'Orb.

Paleont. Française Echinoides Irreguliers, Terr. Crét. t. 6, pp. 329, 330, pl. 926, figs. 6-12. Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama.

— **æquoreus** (Morton) Desor. (1858.)

Synop. Echinides Foss., p. 290. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Prairie bluff, Alabama.

— **æquoreus** (Morton) Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Alabama.

— **florealis** (Morton) Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: New Jersey.

— **micrococcus** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 519. Phila., 1861. Wm. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **micrococcus** (Gabb) Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Alabama.

— **porrectus** n. s. Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Mississippi.

— **stantoni** n. s. Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Colorado.

— **subconicus** n. s. Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Mississippi.

— **subquadratus** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 291, pl. 47, fig. 19. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Mississippi.

— **subquadratus** (Conrad) Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Mississippi.

Cassiope (Coquand) White. (1874.)

Prelim. Rep. Invert. Foss.; Geogr. and Geol. Expl. and Sur. West of 100th Meridian, p. 27. Wash., 1874. C. A. White.

Cassiope—Continued.— **whitfieldi** n. s. White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur. West of 100th Merid., G. M. Wheeler, p. 27. Wash., 1874. C. A. White.

Formation: Cretaceous.

Location: At the head of Le Verken creek, and also in Pace's cañon, Utah.

— **whitfieldi** White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. West of 100th Meridian, vol. 4, pt. 1, p. 196, pl. 18, fig. 1a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: At the head of Le Verken creek, and also in Pace's cañon, Utah.

Cassiopella n. g. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 3, p. 606. Wash., 1877. C. A. White.

— **turricula** n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 3, p. 606. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyo.

— **turricula** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 220. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— **turricula** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 58, pl. 23, figs. 25-29. Wash., 1883. C. A. White.

Location: Black Buttes, Wyo.

— **turricula** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 97, pl. 27, figs. 3a-g. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

Catillus (subgen. Brong.?) (Chenu.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 39. Wash., 1876. F. B. Meek.

Catopygus (Agas.) Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 39. Phila., 1850-1854. T. A. Conrad.

— **oviformis** (Couper MSS.) Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 39, pl. 1, fig. 15. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

— **oviformis** (Conrad) Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: New Jersey.

— **pusillus** n. s. Clark. (1891.)

Johns Hopkins Univ. Cir. vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: Monmouth County, New Jersey.

Cavaria pustulosa (Hag.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 220. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Brownville, New Jersey.

Cavea (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 175. Phila., 1862, 1863. Gabb & Horn.

— **prisca** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 175, 176 [pl. 21], fig. 67. Phila., 1862, 1863. Gabb & Horn.

Formation: [Cretaceous?]

Location: Fort Belknap, Texas.

Cellepora [Fabr.] Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 400. Phila., 1858-1860. Wm. M. Gabb.

— **bilabiata** n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 366. Phila., 1861. Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

— **bilabiata** (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 400, pl. 69, figs. 21-23. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

— **carinata** n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 366. Phila., 1861. Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

— **carinata** (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 400, pl. 69, figs. 24-26. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

— **exserta** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 125 [pl. 19], fig. 6. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica Hill, New Jersey.

— **granulosa** (Hag.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 219, 220. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

— **janewayi** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 126 [pl. 19], fig. 7. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Seven miles below Yazoo, Miss.

[This specimen was evidently not found in place, as the locality has yielded no other Cretaceous fossils and is nearly 75 miles SW. of the known Cretaceous area in the well-known Tertiary region.]

Cellepora—Continued.— **prolifera** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 124, 125. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

(= *Cellepora bilabiata* G. & H.)

— **pumila** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 126, 127 [pl. 19], fig. 8. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

— **pusilla** (Hag.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 219. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Near Brownville and Turtle Mill, N. J.

— **tubulata** n. s. Lonsdale. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, p. 70, figs. a-c. London, 1845. William Lonsdale.

Formation: Cretaceous.

Location: Lewis creek (South Washington, North Carolina), and Timber creek, New Jersey.

— **typica** n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 366. Phila., 1861. Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

— **typica** (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 400, pl. 69, figs. 27-29. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

Celtites (?) **vancouverensis** n. s. Whiteaves. (1887.)

Geol. and Nat. Hist. Surv. Can., vol. 2, n. ser., 1886, App. I, pp. 110, 111 B. Montreal, 1887. J. F. Whiteaves.

Formation: Triassic.

Location: North entrance point of Houston Stewart channel, Queen Charlotte islands, at east end of channel; Crescent inlet, Moresby island, Q. C. I.; north shore of Kun-ga Island, Q. C. I.; Browning creek, Forward inlet, Quatsino sound, Vancouver island, and Forward inlet, near Observatory rock, Robson island, Forward inlet, east side of Winter harbour, Forward inlet, a mile and a half north of Log Point, Alexander harbour, Galiano island, north end of Vancouver island, and Hernandez island, Strait of Georgia.

Ceratia (H. & A. Adams) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 21. Wash., 1889. C. A. White.

— **nexilia** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 21, pl. 3, figs. 13 and 14. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: [Near Pence's ranch, Butte county, Cal.]

Ceratites (De Haan) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 22. Phila., 1864. W. M. Gabb.

— **americanus** n. s. Harper. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 126-128, figs. A and B, p. 127. Phila., 1857. L. Harper.

Formation: Cretaceous.

Location: Bed of Black Warrior river, near Erie, Greene county, Alabama.

— **haidingerii** (Hauer) Gabb. (1864.)

Geol. Surv. Cal. Paleont., vol. 1, pp. 22, 23, pl. 5, figs. 8, 9; pl. 4, fig. 9. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Humboldt Mining region, Nevada.

— **virginianus** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 307, pl. 48, figs. 27a-c. Phila., 1858-1860. Wm. M. Gabb.

Formation: Triassic?

Location: Bath county, Virginia.

— **whitneyi** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 23, 24, pl. 4, figs. 11-13. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: [California.]

Cerastoderma (subgen. Poli) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 166. Wash., 1876. F. B. Meek.

Cercomya (Agassiz) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 178. Wash., 1885. R. P. Whitfield.

— **peculiaris** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 178, pl. 23, figs. 24, 25. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Crosswicks, New Jersey.

Cerithidea (Swain.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 558. Wash., 1876. F. B. Meek.

— ? **nebrascensis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26, fig. 19. Wash., 1883. C. A. White.

Formation: Cretaceous.

— (**Pirenella**) **nebrascensis** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Part 1, p. 90. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near the head of Little Missouri river.

— (**Pirenella**)? **nebrascensis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 559, pl. 43, figs. 9 a, b, c (bis). Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Head of Little Missouri.

Cerithiopsis (Forbes & Hanley) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 116. Phila., 1864. W. M. Gabb.

Cerithiopsis—Continued.

- **alternata** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 116, pl. 21, figs. 114, 114 a. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Northeast of Martinez and Cochran's, east of Mount Diablo, Cal.
- **moreauensis** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 335-337, pl. 31, fig. 4, fig. 38, p. 336. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Moreau river. [S. Dakota.]

Cerithium [Brug.] N. & G. (1840.)

- Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, p. 215, Bruxelles, 1840. Nyst & Galeotti.
- **sp. undt.** Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges., Band 22, p. 237. Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: New Jersey.
- **austinense** n. s. Roemer. (1888.)
 Paleont. Abhandl. Band 4, Heft 4, pp. 16, 17, Taf. I [XXXI], fig. 12. Berlin, 1888. F. Roemer.
 Formation: Cretaceous.
 Location: Two miles above the mouth of Bartons creek, near Austin, Texas.
- **bosquense** n. s. Shumard. (1859.)
 Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 596, 597. St. Louis, 1856-1860. B. F. Shumard.
 Formation: Cretaceous.
 Location: Near Bosque creek, Bosque county, Texas.
- **bustamentii** (Galeotti) N. & G. (1840.)
 Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, pp. 215, 216, fig. 5. Bruxelles, 1840. Nyst & Galeotti.
 Formation: Jurassic.
 Location: Tehuacan, Mexico.
- **cingulatum** n. s. N. & G. (1840.)
 Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, pp. 216, 217, fig. 6. Bruxelles, 1840. Nyst & Galeotti.
 Formation: Jurassic.
 Location: Tehuacan, Mexico.
- **lallierianum** var. **suciense** n. var. Whiteaves. (1879.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 122, 123, pl. 15, figs. 10, 10a. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Sucia islands, Protection island.
- **mexicanum** n. s. Gabb. (1869.)
 Geol. Sur. Cal., Paleont., vol. 2, p. 263, pl. 35, fig. 8. Phila., 1869. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

Cerithium—Continued.

- **nebrascensis** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 125. Phila., 1857. Meek & Hayden.
 Formation: Tertiary [Cretaceous].
 Location: Near head waters of Little Missouri.
- **nodosus** n. s. Tuomey. (1854.)
 Proc. Acad. Nat. Sci. Phila., vol. 7, p. 170. Phila., 1856. M. Tuomey.
 Formation: Cretaceous.
 Location: Alabama.
- **obliterato-granosum** n. s. Roemer. (1888.)
 Paleont. Abhandl. Band 4, Heft 4, p. 16, Taf. I [XXXI], fig. 11. Berlin, 1888. F. Roemer.
 Formation: Cretaceous.
 Location: Two miles above the mouth of Bartons creek, near Austin, Texas.
- **pillingi** n. s. White. (1885.)
 Bull. U. S. Geol. Sur., No. 22, p. 13, pl. 5, figs. 3-6. Wash., 1885. C. A. White.
 Formation: Cretaceous.
 Location: Shore of Todos Santos bay, lower California.
- **skidegatense** n. s. Whiteaves. (1884.)
 Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 215, pl. 27, figs. 3, 3a. Montreal, 1884. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: East end of Maud island, opposite Leading island.
- **suturosum** n. s. N. & G. (1840.)
 Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, p. 215, fig. 4. Bruxelles, 1840. Nyst & Galeotti.
 Formation: Cretaceous.
 Location: Tehuacan, Mexico.
- **totium-sanctorum** n. s. White. (1885.)
 Bull. U. S. Geol. Sur., No. 22, p. 13, pl. 5, figs. 12 and 13. Wash., 1885. C. A. White.
 Formation: Cretaceous.
 Location: Shore of Todos Santos bay, Lower California.
- (?) **sp. undet.** Roemer. (1849.)
 Texas, p. 414. Bonn., 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall near New Braunfels, Tex.
- (?) **sp. undet.** Roemer. (1852.)
 Kreide, von Texas, p. 38. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall of the Guadalupe below New Braunfels, Tex.
- ? **sp. undet.** White. (1889.)
 Bull. U. S. Geol. Sur., No. 51, pp. 62, 63, pl. 9, fig. 5. Wash., 1889. C. A. White.
 Formation: Cretaceous.
 Location: Palace camp Washington.
- Ceripora sessilis** (Hag.) Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges., Band 22, p. 220. Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Brownville, N. J.

Chaetetes (Fischer) White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 2, p. 220. Wash., 1880. C. A. White.

— ? ? dimissus n. s. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 2, pp. 220, 221. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Fossil creek, sixteen miles west of Greeley and six miles south of Fort Collins, Colorado.

— ? ? dimissus White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 7, pl. 12, fig. 14a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Fossil ridge, sixteen miles westward from Greeley, and six miles southward from Fort Collins, Colorado.

Chemnitzia (d'Orb.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333. Phila., 1855-1858. T. A. Conrad.

— subgen. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 287. Phila., 1858-1860. T. A. Conrad.

— cerithiformis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 339-341, pl. 32, figs. 10a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau Trading post. [S. Dakota.]

— distans n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333, pl. 35, fig. 30. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— ? gloriosa n. s. Roemer. (1849.)

Texas, pp. 412, 413. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— (?) gloriosa Roemer. (1852.)

Kreide. von Texas, pp. 40, 41, Taf. 4, fig. 12. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

— interrupta n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333, pl. 35, fig. 15. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— meekana n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 299, pl. 48, fig. 1. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluff, Alabama.

Chemnitzia—Continued.**— occidentale n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 391, pl. 68, fig. 10. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Near the Choctaw Mission, Indian Territory.

— planulata Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 162. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— spillmani (Con. ?) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 115, pl. 19, fig. 70. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, north of Oroville, Butte county, California.

— texana (Roem.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 261. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— zebra n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 260, 261, pl. 35, fig. 5. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

Chlamys (Bolton) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 23-25. Wash., 1876. F. B. Meek.

— nebrascensis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 25, 26, pl. 16, figs. 6a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

— nebrascensis (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 31. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: East branch of the Poplar river, on the 49th parallel; Old Wives creek, township 10, range 11, west of 3d principal meridian, Canada.

Cibota (Browne) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328. Phila., 1855-1858. T. A. Conrad.

— lintea n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328, pl. 34, fig. 11. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Cibota—Continued.

- **multiradiata** n. s. Gabb. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 95, pl. 2,
fig. 1. Phila., 1861. Wm. M. Gabb.
Formation: Cretaceous.
Location: Mullica Hill, New Jersey.
- **multiradiata** (Gabb) Whitfield.
(1884.)
Mon. U. S. Geol. Sur., vol. 9, p. 94, pl. 11, figs.
21, 22. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Mullica Hill, New Jersey.
- **obesa** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 93, 94, pl. 11,
figs. 30, 31. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington county, New Jersey.
- **rostellata** (Mort.) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 91, 92, pl. 11,
figs. 34-36. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Freehold, New Jersey.
- **uniopsis** (Con.) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 92, 93, pl. 11,
figs. 32, 33. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near Burlington, New Jersey.
- Cidaritis** (Swains.) Shum. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
609. St. Louis, 1856-1860. B. F. Shumard.
- **armiger** (Morton) Clark. (1891.)
Johns Hopkins Univ. Cir., vol. 10, No. 87, p. 75.
Balto., 1891. Wm. B. Clark.
Formation: Cretaceous.
Location: New Jersey.
- **clavigera** (Koen.) Credner.
(1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 218.
Berlin., 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.
- **diatretum** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 294. New
Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **galeottii** n. s. Desor. (1858.)
Synop. Echinides Foss., p. 10. Paris and Wies-
bade, 1858. E. Desor.
Formation: Jurassic.
Location: Anahuac mountains, 12 leagues west-
northwest of Tehuacan, Mexico.
- **hemigranosus** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp.
609, 610. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Upper part of the Bluffs of Red river,
Lamar county, Texas, and ten miles above the
mouth of Kiamesha creek.
- **hemigranosus** (Shumard) White.
(1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 38, pl. 18, figs. 2a, b. Wash.,
1883. C. A. White.

Cidaritis—Continued.

- **sceptrifera** (Mant.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 218.
Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.
- **texanus** n. s. Clark. (1891.)
Johns Hopkins Univ. Cir., vol. 10, No. 87, p. 75.
Baltimore, 1891. Wm. B. Clark.
Formation: Cretaceous.
Location: Texas.
- **walcotti** n. s. Clark. (1891.)
Johns Hopkins Univ. Cir., vol. 10, No. 87, p. 75.
Baltimore, 1891. Wm. B. Clark.
Formation: Cretaceous.
Location: New Jersey.
- ? **sp. undet.** Morton. (1829.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, p. 123. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Big Timber creek, Gloucester county,
New Jersey.
- Cidarites** (Lam.) Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 75. Phila.,
1834. S. G. Morton.
- **armiger** n. s. Morton. (1842.)
Jour. Acad. Nat. Sci., Phila., vol. 8., 1st ser.,
1839-1842, p. 215, pl. 11, fig. 1. Phila., 1839-
1842. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **diatretum** Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, pl. 10, fig. 10.
New Haven, 1833. S. G. Morton.
[Described in vol. 23 as *Cidaritis diatretum* n. s.]
- **diatretum** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 75, pl. 10, fig.
10. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Gloucester, New Jersey.
- **glandiferus** (Goldf.) N. & G. (1840.)
Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2,
p. 219, fig. 12. Bruxelles, 1840. Nyst & Galeotti.
Formation: Jurassic.
Location: Tehuacan, Mexico.
- **propinquus** (Munster) N. & G.
(1840.)
Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, p.
218, fig. 10. Bruxelles, 1840. Nyst & Galeotti.
Formation: Jurassic.
Location: Tehuacan, Mexico.
- **pustulosus** n. s. N. & G. (1840.)
Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2,
p. 219, fig. 11. Bruxelles, 1840. Nyst & Galeotti.
Formation: Jurassic.
Location: Tehuacan, Mexico.
- **splendens** n. s. Morton. (1841.)
Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843,
pp. 132, 133. Phila., 1843. S. G. Morton.
Formation: Cretaceous.
Location: Timber creek, in Gloucester county,
New Jersey.

Cinulia (Gray) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 111. Phila., 1864. W. M. Gabb.

— **(Gray) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 283. Wash., 1876. F. B. Meek.

— **concinna (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can.; Cont. Can., Paleont., vol. 1, pt. 1, p. 46. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Twelve miles east of White Mud river (or Frenchman's creek); elbow of South Saskatchewan; Old Wives' creek, township 10, range 11, west of 3d principal meridian: "Two creeks, on the Assiniboine," Canada.

— **inflata(?) (Gabb) Whiteaves. (1874.)**

Geol. Sur. Canada; Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, $2\frac{1}{4}$ and $2\frac{1}{2}$ miles up.

— **mathewsonii n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 111, pl. 19, fig. 65. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bull's Head point, Martinez; Orestimba cañon, Stanislaus county, California.

— **obliqua n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 111, pl. 19, fig. 64, 64a-c. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan Springs, Martinez; Pence's ranch, above Oroville; Chico creek, Texas Flat, Placer county; Cottonwood creek, Siskiyou mountains, Siskiyou county, California.

— **obliqua (?) (Gabb) Whiteaves. (1874.)**

Geol. Sur. Canada; Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Protection island.

— **obliqua (Gabb) Whiteaves. (1879.)**

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, p. 131. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; southwest side of Denman island; Nanaimo river, $2\frac{1}{2}$ miles up, Vancouver island; Protection, Gabriola, and Salt Springs or Admiralty islands; also at the Sucia islands.

— **obliqua (Gabb) White. (1889.)**

Bull. U. S. Geol. Sur., No. 51, p. 44. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

— **pinguis n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 112, pl. 29, figs. 221, 221a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bluffs a mile west of Martinez, Cal.

Cinulia—Continued.— **pusilla n. s. Whiteaves. (1884.)**

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 217, 218, pl. 28, figs. 5, 5a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South island, in Skidegate inlet.

— **rectilabrum n. s. Gabb. (1869.)**

Geol. Sur. Cal., Paleont., vol. 2, pp. 264, 265, pl. 35, figs. 10, 10a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Mexico.

— **(oligoptycha) concinna (H. & M.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 284, pl. 31, figs. 6, bis, a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, S. Dakota; Yellowstone river, Montana; on the Assiniboine river, British America.

— **sp. undet. Whiteaves. (1874.)**

Geol. Sur. Canada, Rep. Prog. for 1873-1874, p. 264. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

— **sp. undet. Whiteaves. (1884.)**

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, p. 249. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

Cinuliopsis n. g. Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, p. 131. Montreal, 1879. J. F. Whiteaves.

— **typica n. s. Whiteaves. (1879.)**

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, pp. 131, 132, pl. 16, figs. 7, 7a, b. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

Cirrus (Sowerby) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 49. Phila., 1834. S. G. Morton.

— **crotaloides n. s. Morton. (1834.)**

Synop. Org. Rem. Cret. Gr. U. S., p. 49, pl. 19, fig. 5. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Erie, Alabama.

Cirsotrema tenuisculptum n. s. Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 127, pl. 16, figs. 3, 3a-c. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

Cladophyllia furcifera n. s. Roemer. (1888.)

Paleont. Abhandl. Band 4, Heft 4, pp. 8, 9, Taf. 1 [xxx], figs. 4a, 4b. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Texas.

Clavagella (Deshayes) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 69. Phila., 1834.
S. G. Morton.

— **armata n. s.** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, pp. 129, 130, pl. 9,
fig. 11. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **armata** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 69, pl. 9, fig. 11.
Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Near Arneytown, New Jersey; Prairie
Bluff, Alabama.

— **armata** (Mort.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 364.
Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **armata** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 192, 193, pl. 25,
fig. 24. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Walnford, Monmouth county, and near
New Egypt, New Jersey.

Clavatula ? **californica n. s.** Conrad.
(1855.)

Rep. Expl. and Sur. R. R. R. Mississippi river to
Pacific ocean, Prelim. Geol. Rep. of W. P.
Blake, Pal., p. 11. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— ? **californica** Conrad. (1856.)

Rep. Expl. and Sur. R. R. R. Mississippi river to
Pacific ocean, vol. 5, app., p. 322, pl. 2, fig. 11.
Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

Clavellithes (**Piestochilus**) **scar-**
boroughi (M. & H.) Meek. 1864.

Check List Invert. Foss., N. Am. Cret. and Jur.,
Smithson. Mis. Coll., vol. 7, No. 177, p. 37.
Wash. 1864. F. B. Meek.

Formation: Cretaceous.

Location: Dakota.

Clavigella (Sow.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245. New
Haven, 1830. S. G. Morton.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245. New
Haven, 1830. S. G. Morton.

Formation: Ferruginous sand. [Cretaceous.]

Location: New Jersey.

Clisocolus n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 188, 189.
Phila., 1869. Wm. M. Gabb.

— **cordatus** (M. & H.) Whiteaves.
(1879.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 2, pp. 157,
158, pl. 18, fig. 3, 3a, b. Montreal, 1879. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two
and a quarter miles up.

Clisocolus—Continued.— **cordatus** (Whiteaves) White.
1889.

Bull. U. S. Geol. Sur., No. 51, pp. 41, 42, pl. 6,
figs. 8, 9. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

— **dubius n. s.** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 189. Phila.,
1869. Wm. M. Gabb.

Formation: Cretaceous.

— **dubius** (Gabb) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 41, pl. 6, figs.
5-7. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia island.

Closteriscus n. g. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 306, 307.
Wash., 1876. F. B. Meek.

— **tenuilineatus** (H. & M.) Meek.
(1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 308, 309, pl.
19, figs. 10a, b, and fig. 9c. Wash., 1876. F.

B. Meek.

Formation: Cretaceous.

Location: Cheyenne river [S. Dakota].

Clydonites (Hauer) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
p. 109. Wash., 1877. F. B. Meek.

— **laevadorsatus** (Hauer) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 109, 110, pl. 10, fig. 7. Wash., 1877. F. B.

Meek.

Formation: Triassic.

Location: Buena Vista cañon, North Fork, Hum-
boldt range, Nevada.

Clypeaster (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New
Haven, 1830. S. G. Morton.

— **florealis n. s.** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294. New
Haven, 1833. S. G. Morton.

Formation: Ferruginous sand. [Cretaceous.]

Location: Delaware.

— **florealis** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, pl. 10, fig. 12.
New Haven, 1833. S. G. Morton.

— **florealis** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 76, pl. 3, fig.
12, pl. 10, fig. 12. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal.

— **geometricus n. s.** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig.
9. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal.

— **geometricus** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 76, pl. 10, fig.
9. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Canal excavations of Delaware.

Clypeaster—Continued.— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.

Cœlosmilia americana n. s. Roemer. (1888.)

Paleont. Abhandl. Band 4, Heft 4, pp. 6, 7, Taf. 1 [xxx], figs. 5a, b. Berlin, 1888. F. Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Barton's creek, near Austin, Tex.

— **? atlantica** (Mort.) Bölsche. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 217. Berlin, 1870. Wilh. Bölsche.
Formation: Cretaceous.
Location: Brownville, N. J.

Columna (Perry) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 554, 555. Wash., 1876. F. B. Meek.

— **teres** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 555–556, pl. 44, figs. 11a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Near Fort Union, [N.] Dakota, on the upper Missouri.

— **teres** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Evanston coal mines, Wyoming.

— **teres** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 88. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Mouth of Judith river, Montana.

— **teres** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 454, pl. 25, fig. 15. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.

— **vermicula** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 556, 557, pl. 44, figs. 12a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Near Fort Union, on the upper Missouri.

— **vermicula** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 88. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Mouth of Judith river, Montana.

— **vermicula** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 454, pl. 25, fig. 16. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.

— **vermicula** var. **contraria** n. var. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 557. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Near Fort Union, on the upper Missouri.

Cominella (Gray) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 22. Wash., 1889. C. A. White.

— **lecontii** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 22, pl. 4, figs. 4 and 5. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Near Pence's ranch, Butte county, California.

Complanaria (subgen. Swainson) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 113. Wash., 1876. F. B. Meek.

— **cretacea** n. s. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog., for 1873–74, pp. 264, 266, 267, pl. fig. 2. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Below Dodd Narrows.

— **cretacea** Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 156, 157. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Below Dodd Narrows, Vancouver island.

Conus [Linn.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 49. Phila., 1834. S. G. Morton.

— **canalis** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci. Phila., vol. 3, 2d ser., 1855–1858, p. 331, pl. 35, fig. 22. Phila., 1855–1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **gyratus** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig. 3. New Haven, 1833. S. G. Morton.
Formation: Cretaceous [Tertiary].

Location: Southern states.

— **gyratus** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 49, pl. 10, fig. 13. Phila., 1834. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: South Carolina.

— **hornii** n. s. Gabb. (1864.)

Geol. Sur. Cal., Palaeont., vol. 1, pp. 122, 123, pl. 29, fig. 226. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Alizos creek, near Fort Tejon, California.

— **remondii** (Con.) Gabb. (1864.)

Geol. Sur. Cal., Palaeont., vol. 1, p. 122, pl. 20, fig. 79. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cochran's, east of Mount Diablo, and Bull's Head point, northeast of Martinez; Clayton; San Diego; near Cañada, Los Angeles county, California.

— **sinuatus** n. s. Gabb. (1864.)

Geol. Sur. Cal., Palaeont., vol. 1, p. 123, pl. 29, fig. 227. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.

Coralliochama n. g. White. (1885.)

Bull. U. S. Geol. Sur., No. 22, pp. 9, 10. Wash., 1885. C. A. White.

— orcutti n. s. White. (1885.)

Bull. U. S. Geol. Sur., No. 22, pp. 10-12, pls. 1-4. Wash., 1885. C. A. White.

Formation: Cretaceous.

Location: Shore of Todos Santos bay, Lower California, and near the town of Wallala, Mendocino county, California.

Corbicula (Megerle) Prime. (1865.)

Mon. Am. Corbiculadæ (Recent and Fossil), Smithsonian. Misc. Coll. vol. 7, No. 145, pp. 2, 3. Wash., 1865. T. Prime.

— (Mühlfeldt) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 161. Wash., 1876. F. B. Meek.

— æquilateralis n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 495. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Bear River city (Sulphur creek), Wyoming.

— annosa (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 26, 27, pl. 2, figs. 2-4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near Washington, Middlesex county, New Jersey; Sayre and Fisher's brick and clay yards, near Sayreville, New Jersey; near Woodbridge, N. J.

— augheyi n. s. White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 95, pl. 4, figs. 4-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of South Platte river, north-eastern Colorado.

— augheyi White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 438, pl. 21, figs. 4-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of the South Platte river, in Northern Colorado, east of the Rocky mountains.

— berthoudi n. s. White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, pp. 94, 95, pl. 4, figs. 1-3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of South Platte river, north-eastern Colorado.

— berthoudi White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 438, pl. 21, figs. 1-3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains in Colorado.

— cardiniæformis n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, pp. 911-912. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, fifteen miles above its confluence with Platte river, northern Colorado.

Corbicula—Continued.**— cardiniæformis White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 169. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— cardiniæformis White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 73, pl. 25, figs. 5a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, fifteen miles above the confluence of that creek with Platte river, northern Colorado.

— cleburni n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 711. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Crow creek, Colorado, about twelve miles north of its confluence with South Platte river.

— cleburni White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 168, 169. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— cleburni White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 73, 74, pl. 23, figs. 1a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, northern Colorado, about fifteen miles above the confluence of that creek with Platte river.

— cleburni White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 20, figs. 7-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of the South Platte, Colorado.

— ? crassatelliformis n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 315, 316. Wash., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Hallville coal mines [Wyoming].

— cytheriformis (M. & H.) Prime. (1865.)

Mon. Am. Corbiculadæ (Recent and Fossil), Smithsonian. Misc. Coll., vol. 7, No. 145, p. 9. Wash., 1865. T. Prime.

Formation: Tertiary [Cretaceous].

Location: Near the mouth of the Judith river, Nebraska [Montana].

— cytheriformis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 520, 521, pl. 40, figs. 5a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Bad Lands of Judith river, on the upper Missouri, in Montana; mouth of Muscle-shell river; from near Fort Benton, and from one hundred and twenty-five miles below the same.

Corbicula—Continued.

- **cytheriformis** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 212. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Danforth hills, Colorado.
- **cytheriformis** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bitter creek valley, two miles west of Point of Rocks station, Wyoming.
- **cytheriformis** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 219. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black Buttes station, Wyoming.
- **cytheriformis** (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 74, pl. 21, figs. 4a-d. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: About two miles west of Point of Rocks station, Wyoming.
- **cytheriformis** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 22, figs. 1-6. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **cytheriformis** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 7. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rye-grass flat, Old Man river, Canada.
- **? emacerata** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 26, pl. 2, figs. 5 and 6. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Clay banks near Woodbridge, N. J.
- **? fracta** n. s. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 314, 315. Wash., 1871. F. B. Meek.
Formation: Tertiary [Cretaceous].
Location: Hallville coal mines [Wyoming].
- **? fracta** var. **crassiuscula** n. var. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 512, 513. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Black Buttes, Wyo.
- **moreauensis** (M. & H.) Prime. (1865.)
Mon. Am. Corbiculadæ (Recent and Fossil), Smithsonian Misc. Coll., vol. 7, No. 145, pp. 7, 8. Wash., 1865. T. Prime.
Formation: Tertiary [Cretaceous].
Location: Near Moreau river, Nebraska [S. Dakota].

Corbicula—Continued.

- **nebrascensis** (M. & H.) Prime. (1865.)
Mon. Am. Corbiculadæ (Recent and Fossil), Smithsonian Misc. Coll., vol. 7, No. 145, p. 8. Wash., 1865. T. Prime.
Formation: Tertiary [Cretaceous].
Location: Near Moreau river, Nebraska [S. Dakota].
- **nebrascensis** (M. & H.) Meek (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 522, pl. 43, figs. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau River, [S.] Dakota.
- **nebrascensis** (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, p. 74. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **nebrascensis** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 20, figs. 12, 13. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **? nucalis** n. s. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 304, 305. Wash., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Kans.
- **nucalis** Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 163, 164, pl. 2, figs. 5a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Kansas.
- **obesa** n. s. White. (1878.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, pp. 712, 713. Wash., 1878. C. A. White.
Formation: Cretaceous.
Location: Valley of Crow creek, Colorado, fifteen miles north of its confluence with South Platte river.
- **obesa** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 169. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Crow Creek valley, Colorado.
- **obesa** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 190. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Bijou creek, Colorado.
- **obesa** White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, pp. 72, 73, pl. 23, figs. 3a-e. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valleys of Crow and Bijou creeks, northern Colorado.

Corbicula—Continued.— **obesa** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 23, figs. 7-11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of the South Platte and its tributaries, Colorado.

— **obliqua** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 8, 9, pl. 1, figs. 4, 4a, b, Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rye-grass flat, Old Man river, Bow river, eight miles west of Blackfoot crossing; Upper Belly river, twenty-two miles above the mouth of the Waterton, and Little Bow river, opposite the mouth of Snake valley, Canada.

— **occidentalis** (M. & H.) Prime. (1865.)

Mon. Am. Corbiculadae (Recent and Fossil), Smithsonian Misc. Coll., vol. 7, No. 145, pp. 8, 9. Wash., 1865. T. Prime.

Formation: Tertiary [Cretaceous].

Location: Bad lands of the Judith river, Nebraska [Montana].

— **occidentalis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 521, 522, pl. 40, figs. 6a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Bad lands of the Judith river, Montana, on the Upper Missouri.

— **occidentalis** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 208, 209. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Cañon park, Colorado.

— **occidentalis** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 216. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Point of Rocks station, Wyoming.

— **occidentalis** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 219. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— **occidentalis** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 75, pl. 21, figs. 3a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valleys of Bitter creek and Yampa river.

— **occidentalis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 17, figs. 6, 7, pl. 23, figs. 1-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Corbicula—Continued.— **occidentalis** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 7-8, pl. 1, figs. 3, 3a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: St. Mary river, two miles north of the 49th parallel, and four miles west of the St. Mary river; Bow river, mouth of East Arrow-wood creek; Rye-Grass flat, Old Man river; upper Belly river, twenty-two and twenty-three miles above the mouth of the Waterton; Oyster creek; northwest branch of the north fork of the Old Man river; Red Deer river, near the 8th correction line, and forks of the Devil's Pine and Three Hills creeks, Canada.

— **occidentalis** (M. & H.) Whiteaves (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 40. Montreal 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Milk river ridge, Canada.

— **occidentalis** (M. & H.) Whiteaves (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 67, 68. Montreal 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: North side of the Milk river, five miles below Pa-Kow-Ki coulée, Canada.

— **pugetensis** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 60, pl. 11, fig. 8. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Carbonado, Washington.

— **subelliptica** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 20, figs. 10-11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— ? **subtrigonalis** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 305-306. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— ? **subtrigonalis** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 164, 165, pl. 2, fig. 6. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **umbonella** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 438, pl. 21, figs. 7-10. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains in Colorado.

— **willisi** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 59, pl. 11, figs. 3-7. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Carbonado, Wilkeson (Fletts creek), and valley of Green river, Washington.

Corbicula—Continued.

— ? (*Astarte*?) *pikensis* n. s. Hill.
(1888.)

Ann. Rep. Geol. Sur. Arkansas, for 1888, vol. 2,
p. 134, pl. 2, figs. 13, 13a, 14-17. Little Rock,
1888. R. T. Hill.

Formation: Cretaceous.

Location: Throughout the Trinity beds in Arkansas.

— [*Cyrena*?] *securis* n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 494, 495. Wash., 1873. F. B. Meek.
Formation: Cretaceous.

Location: Bear River city (Sulphur creek), Wyoming.

— (*Leptesthes*) *cardiniæformis*
White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 22,
figs. 10-15. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains in Colorado.

— (*Leptesthes*) *fracta* (M. & H.)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 169. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— (*Leptesthes*) *fracta* (Meek) White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 209. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Cañon park, Colorado.

— (*Leptesthes*) *fracta* (Meek) White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 212, 213. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colorado.

— (*Leptesthes*) *fracta* (Meek) White.
(1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 75-77, pl. 23, figs. 2a-e, pl. 21,
fig. 5a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Hallville, [Wyoming].

— (*Leptesthes*) *fracta* (Meek.) White.
(1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 439, pl. 20, figs.
1-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyoming.

— (*Leptesthes*) *macropistha* n. s.
White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, p. 713. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Crow creek, northern Colorado, 15
miles above its confluence with the South Platte
river.

Corbicula—Continued.

— (*Leptesthes*) *macropistha* White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 169. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— (*Leptesthes*) *macropistha* White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 190. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colorado.

— (*Leptesthes*) *macropistha* White.
(1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 78, 79, pl. 23, figs. 4a-f. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Valleys of Crow and Bijou creeks,
northern Colorado.

— (*Leptesthes*) *macropistha* White.
(1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 21,
figs. 11-14. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains in Colorado.

— ? (*Leptesthes*) *planumbona* n. s.
Meek. (1875.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 1, No.
1, 2d ser., pp. 43-45. Wash., 1875. F. B.
Meek.

Formation: [Cretaceous.]

Location: Two hundred miles east of Denver,
Colo.

— (*Leptesthes*) *planumbona* (Meek.)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 190. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colorado.

— (*Leptesthes*) *planumbona* (Meek.)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 169, 170. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colorado.

— (*Leptesthes*) *planumbona* (Meek.)
White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 77, 78, pl. 21, figs. 2a-d. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Two hundred miles east of Denver
city, on the Kansas Pacific railroad; valleys of
Crow and Bijou creeks, northern Colorado.

— (*Leptesthes*) *planumbona* (Meek)
White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 22, figs.
7-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains in Colorado.

Corbicula—Continued.— (**Leptesthes**) **subelliptica** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 523, 524, pl. 43, figs. 9a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On Cherry creek, [S.] Dakota; and on Bijou creek, Colorado.

— (**Leptesthes**) **subelliptica** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 169. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— (**Leptesthes**) **subelliptica** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 190. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colorado.

— (**Leptesthes**) **subelliptica** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 79. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri River region; valley of Bijou creek, northern Colorado.

— (**Leptesthes**) **subelliptica** (var. **moreauensis** n. var.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 524, pl. 43, figs. 1a-b, 2c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, [S.] Dakota.

— (**Veloritina**) **bannisteri** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 513. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Black Butte station, Wyoming.

— (**Veloritina**) **cytheriformis** (M. & H. ?) Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 511. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Point of Rocks, on Bitter creek, Wyoming.

— **Veloritina** (**durkeei**) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 167-170, pl. 16, figs. 6a-g. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: On Sulphur creek, near Bear river, Wyoming.

— (**Veloritina**) **durkeei** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, Wyoming.

Corbicula—Continued.— (**Veloritina**) **durkeei** (Meek) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 79-80. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, near the mouth of Sulphur creek.

— (**Veloritina**) **durkeei** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 437, pl. 8, figs. 8-11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming and adjacent parts of Utah.

— (**Veloritina**) **inflexa** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 493, 494. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Near Missouri river, below Gallatin city, Mont.

— sp. undet. White. (1879)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 212. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colorado.

Corbis ? sp. undet. Roemer. (1849.)

Texas, p. 407. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— sp. undet. Roemer. (1852.)

Kreide von Texas, p. 47. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Corbula (Brug.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 150. Wash., 1857. T. A. Conrad.

— **alæformis** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 177, pl. 29, fig. 63. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near Lower Lake village, Lake county, California.

— **bisulcata** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 11, pl. 2, figs. 13, 14. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **blakei** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 29, pl. 5, fig. 24. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Humboldt mining region.

— **carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 11, pl. 2, fig. 15. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Corbula—Continued.

- **caudata** n. s. Tuomey. (1854.)
Proc. Acad. Nat. Sci., Phila., vol. 7, p. 170.
Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: Noxubie [Mississippi].
- **concinna** n. s. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 219, 220, pl. 29, figs. 3, 3a. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Alliford bay, Skidegate inlet; Bear Skin bay.
- **crassatelliformis** (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 80. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Crow creek, Colorado, east of the Rocky mountains.
- **crassimarginata** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 244, 245, pl. 17, figs. 14a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, [S.] Dakota.
- **crassiplica** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 394, pl. 68, fig. 25. Phila., 1858-1860. Wm. M. Gabb.
Formation: Cretaceous.
Location: Cut on the Memphis and Charleston Railroad where it crosses the Tennessee and Mississippi state line.
- **crassiplica** (Gabb) Whitfield. (1884.)
Mon. U. S. Geol. Sur., vol. 9, pp. 178, 179, pl. 23, fig. 30. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **cultriformis** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 149, pl. 22, fig. 122. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: West of Martinez, California.
- **dubiosa** n. s. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 236. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **dubiosa** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 249. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear River valley, Wyoming.
- **dubiosa** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 250. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyoming.
- **elegans** (Sow.) Eichwald. (1871.)
Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 133, 134. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Kadiak island, Alaska.

Corbula—Continued.

- **engelmanni** Meek. (1876.)
Rep. Expl. Great Basin Terr., Utah, p. 362, pl. 5, figs. 13a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous?
Location: Bear river, near the mouth of Sulphur creek.
- **englemanni** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear River valley, Wyoming.
- **eufaulensis** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 283. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula, Alabama.
- **foulkei** n. s. Lea. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 149. Phila., 1862. Isaac Lea.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **foulkei** (Lea) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 180, pl. 23, figs. 27-29. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **? gregaria** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 84. Phila., 1856. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, 150 miles from mouth, Nebraska [Montana].
- **graysonensis** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 603. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Post-oak creek, near Sherman, Grayson county, Texas.
- **hornii** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 149, 150, pl. 29, fig. 238. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.
- **hornii** Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, p. 176, pl. 29, figs. 62a, b. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
- **inornata** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 52. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Long lake.
- **inornata** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 245, 246, pl. 30, figs. 4a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Long lake, near Fort Pierre, [S.] Dak.
- **mactrififormis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 117. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Clark [N. Dakota].

Corbula—Continued.

- **mactriformis** (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 80. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Fort Clark, in the Upper Missouri River region.
- **mactriformis** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 442, pl. 18, figs. 12-15. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri River region.
- **mactriformis** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can.; Cont. Can., Paleont., vol. 1, pt. 1, p. 27. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Wood End depot, Souris river, Canada.
- **moreauensis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 83, 84. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota].
- **minima** (d'Orb.) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 13, pl. 17, figs. 4, 4a. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island.
- **nematophora** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 496, 497. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Near Cedar city, southern Utah.
- **nematophora** (Meek) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of 100th meridian, vol. 4, pt. 1, pp. 188, 189, pl. 17, figs. 7a-c. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Plateau near the west crossing of the north fork of Virgin river, and elsewhere near the north fork of that river, Utah.
- **nematophora** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 236. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **nematophora** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 290, 291, pl. 3, figs. 4a-d. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near Cedar City, southern Utah.
- **occidentalis** n. s. Conrad. (1854.)
Rep. U. S. and Mex., Bound. Sur., vol. 1, pt. 2, p. 150, pl. 6, fig. 9. Wash., 1857. T. A. Conrad.
Formation: Eocene? [Cretaceous].
Location: Western Texas.

Corbula—Continued.

- **oxynema** n. s. Conrad. (1875.)
Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr, App. A., p. 11. T. A. Conrad.
Formation: Cretaceous.
Location: Cape Fear river, North Carolina.
- **parilis** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 150, pl. 29, figs. 239, 239a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez to Marsh's, east of Mount Diablo and San Diego, Cal.
- **perangulata** n. s. Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can.; Cont. Can., Paleont., vol. 1, pt. 1, pp. 9-11, pl. 1, figs. 5, 5a, b, pl. 2, fig. 1. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rye-Grass flat, Old Man river; upper Belly river, twenty-three miles above the mouth of the Waterton, and Scabby butte, seven miles north of the confluence of the Belly and Old Man rivers, Canada.
- **perbrevis** n. s. Conrad. (1875.)
Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, App. A., p. 11, pl. 2, fig. 5. T. A. Conrad.
Formation: Cretaceous.
Location: Snow Hill, Greene county, North Carolina.
- **perundata** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 116. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Mouth of the Judith [Montana].
- **perundata** (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 80. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **perundata** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 9. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South or first branch of the Milk river, N. W. T., Canada.
- **perundata** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 62. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Peigan creek, township 7, range 6 west of 4th principal meridian, near U. S. boundary line, on a branch of the east fork of the Milk river, Canada.
- **perundata** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 69. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Creek "about fourteen miles northeastward from the most eastern of the Three buttes," Canada.

Corbula—Continued.**— perundata? (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 80. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky Spring ridge, near MacLeod, Benton trail, Canada.

— ? primorsa n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 148, pl. 22, figs. 120, 120a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous?

Location: South side of Corral hollow, Alameda county, California.

— pyriformis (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, Wyoming.

— pyriformis (Meek) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 82. Wash. 1883. C. A. White.

Formation: Cretaceous.

Location: Peculiar to the Bear River Laramie series, and at most of the known localities at which those strata are exposed.

— pyriformis (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. and Geogr. Sur., p. 441, pl. 8, figs. 12-16. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming and the adjacent parts of Utah.

— striatula (Sow.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 236. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Woodbury, N. J.

— subcompressa n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 394, pl. 68, fig. 24. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Two miles east of Middleton, Harde-man county, Tennessee.

— subcompressa (Gabb) Whitfield (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 180, 181, pl. 23, fig. 26. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— subgibbosa n. s. Conrad. (1875.)

Rep. Geol. Surv. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 11, pl. 2, fig. 12. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— subtrigonalis n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 116. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Mouth of the Judith [Montana].

Corbula—Continued.**— subtrigonalis (M. & H.) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 170. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colorado.

— subtrigonalis (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 190. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colorado.

— subtrigonalis (M. & H.) White (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 209. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley near Cañon park, Colorado.

— subtrigonalis (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bitter Creek valley, two miles west of Point of Rocks station, Wyoming.

— subtrigonalis (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 220. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— subtrigonalis (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 80. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— subtrigonalis (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Survey, p. 442, pl. 19, figs. 10-17. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— subtrigonalis (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur., Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 62. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Peigan creek, township 7, range 6, west of 4th principal meridian, Canada.

— subtrigonalis (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur., Can., Cont., Can., Paleont., vol. 1, pt. 1, p. 68. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river east of Driftwood bend, and Belly river near its junction with the Bow

Corbula—Continued.

river; South Saskatchewan, six miles below the mouth of Bow river; north side of Milk river, five miles below Pa-kow-ki Coulee, and south side of Milk river, one mile above the mouth of Pa-kow-ki Coulee; south side of Saskatchewan, one mile below the mouth of the Bow river, Canada.

— **subundifera n. s. White. (1876.)**

Rep. Geol. Uinta Mts., p. 129. Wash., 1875. C. A. White.

Formation: Tertiary [Cretaceous.]

Location: Point of Rocks, Wyoming.

— **subundifera White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 216. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Point of Rocks station, Wyoming.

— **traskii n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 149, pl. 22, figs. 121, 121a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county; Tuscan Springs, Tehama county; Pence's Ranch, Butte county, California.

— **traskii (?) (Gabb) Whiteaves. (1879.)**

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 138, pl. 17, fig. 3. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island.

— **tropidophora n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geog. Sur. Terr., pp. 514, 515. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Point of Rocks, Wyoming.

— **tropidophora (Meek) White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geog. Sur. Terr., pt. 1, p. 80. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Crow creek, Colorado, east of the Rocky mountains.

— **tuomeyi n. s. Shumard. (1859.)**

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 604. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Grayson county, four and a half miles north of Sherman, Tex.

— **undifera n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geog. Sur. Terr., pp. 513, 514. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Rock Springs station, Wyoming.

— **undifera (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geog. Sur. Terr., p. 213. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth Hills, Colorado.

Corbula—Continued.— **undifera (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geog. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Rock Springs, Wyoming.

— **undifera (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geog. Sur. Terr., p. 219. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyoming.

— **undifera (Meek) White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geog. Sur. Terr., pt. 1, pp. 80, 81, pl. 29, figs. 4a-f. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Rock Springs station, Wyoming.

— **undifera (Meek) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 442, pl. 18, figs. 6-9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Bitter creek, southern Wyoming, and Yampa river, northwestern Colorado.

— **undifera var. subundifera n. var. White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geog. Sur. Terr., pt. 1, pp. 81, 82, pl. 29, figs. 5a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Point of Rocks station, Wyoming.

— **undifera var. subundifera White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 442, pl. 18, figs. 10, 11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Bitter creek, southern Wyoming.

— **ventricosa n. s. M. & H. (1856.)**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 83. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebraska [S. Dakota].

— **(Anisorhynchus ?) engelmanni Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 174, 175, pl. 17, fig. 1, 1a. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Bear river, mouth of Sulphur creek, Wyoming.

— **(Anisorhynchus) pyriformis Meek. (1876.)**

Rep. Expl. Great Basin, Terr. Utah, pp. 361, 362, pl. 5, figs. 9, 10. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Bear river, near the mouth of Sulphur creek.

— **(Anisorhynchus) pyriformis Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 170-174, pl. 17, figs. 2a-d. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Sulphur creek, near Bear river, Wyoming.

Corbula—Continued.— (**Azara**) **engelmanni** n. s. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 431.

Phila., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Limestone hill, Bear river [Wyoming].

— (**Azara**) **pyriformis** n. s. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 431.

Phila., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Limestone hill, Bear river.

— (**Azara**) **pyriformis** var. **concentrica** n. var. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 431.

Phila., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Limestone hill, Bear river.

— (**Pachyodon**) **mactriformis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 528, 529, pl. 43, figs. 7a-f. Wash., 1876. F. B. Meek.

Formation: Lower Eocene? [Cretaceous].

Location. Fort Clark, [N.] Dakota, on the Upper Missouri.

— (**Pachyodon**) **perundata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 530, 531, pl. 40, figs. 4a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Mouth of Judith river, Montana.

— (**Pachyodon**) **subtrigonalis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 529, 530, pl. 40, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Mouth of Judith river, Montana.

— (**Potamomya**?) **concentrica** n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 313.

Phila., 1861. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Bear river, lat. 40° 12' north, long. 110° 52' west.

— (**Potamomya**?) **engelmanni** n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 313.

Phila., 1861. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Bear river, lat. 40° 12' north, long. 110° 52' west.

— (**Potamomya**?) **pyriformis** n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, pp. 312, 313.

Phila., 1861. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Bear river, lat. 40° 12' north, long. 110° 52' west.

Corbula—Continued.

— n. s. Hill. (1889.)

Geol. Sur., Texas, Bull. No. 4, p. 16. Austin, 1889.

R. T. Hill.

Formation: Cretaceous.

Location: Gillespie county, Texas.

— sp. undet. Owen. (1860.)

Second Rep. Geol. Rec., Arkansas, pl. 8, fig. 1.

Phila., 1860. D. D. Owen.

Formation: Cretaceous.

Location: Arkansas.

— sp. undet. Meek. (1877.)

Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1, pp. 150, 151, pl. 14, fig. 2. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

Corbulamella n. g. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 142, 143.

Phila., 1858. Meek & Hayden.

— **gregaria** M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 143.

Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Yellowstone river, Nebraska [Montana].

— **gregaria** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 247, pl. 17, figs. 13a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location. On the Yellowstone river, Montana.

— **gregaria** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 1, p. 80. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: West flank of West Butte, Montana, in the Sweet Grass hills, near the international boundary line.

Cordiera (Rouault). Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 93. Phila., 1864. W. M. Gabb.

— **microptygma** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 93, 94, pl. 28, fig. 203. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, California.

— **mitræformis** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 153, 154, pl. 26, fig. 32. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Colusa county, near the Hot Sulphur springs, California.

Corimya (Agassiz) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 170. Wash., 1885. R. P. Whitfield.

— **tenuis** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 170, 171, pl. 23, figs. 9-11. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Upper Freehold and Marshallville, N. J.

Coroceras n. g. Hyatt. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 107, 108. Wash., 1877. Alpheus Hyatt.

Crassatella [Lam.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 66. Phila., 1834. S. G. Morton.

— (Lam.). Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 116. Wash., 1876. F. B. Meek.

— alta Conrad. (1855.)

Rep. Expl. and Sur. R. R. R. Mississippi river to Pacific Ocean, App. Prelim. Geol. Rep. of W. P. Blake, Pal., p. 9. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— alta Conrad. (1856.)

Rep. Expl. and Sur. R. R. R. Mississippi river to Pacific ocean, vol. 5, App., p. 321. Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— cimarronensis n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Ter., pp. 287, 288, pl. 5, figs. 3a-c. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Cimarron, N. Mex.

— compacta n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 190, pl. 30, fig. 85. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— conradi n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 209, 210, pl. 28, figs. 1-5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Shark river, near New Egypt, and at Squankum, N. J.

— cuneata (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 118, 119, pl. 17, figs. 18-20. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Monmouth, N. J.

— delawarensis n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 303, pl. 48, fig. 21 [20]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Deep cut, Delaware and Chesapeake canal.

— delawarensis (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 119. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

— delawarensis (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 210, 211, pl. 27, figs. 14, 15. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Mostly from the pits of John Irons, New Egypt, and other places near by, and also from Poke hill, New Jersey.

Crassatella—Continued.**— eufalensis n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 394, pl. 68, fig. 26. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Alabama.

— evansii n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 383, 384, pl. 1, figs. 9a-e. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek.

— ? exigua n. s. Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, p. 179, Taf. 16, figs. 30, 31. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— grandis n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 181, pl. 24, fig. 163. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Clayton; Alizos creek, near Cañada de las Uvas, California.

— grandis Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 189. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

— ligeriensis (d'Orb.) Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 50, [pl. 1], fig. 10. Phila., 1872. T. A. Conrad.

Formation: Cretaceous.

— lineata n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 201. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Corsicana, Navarro county, Texas.

— linteata n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 279, pl. 46, fig. 5. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama.

— littoralis n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 41, pl. 1, fig. 3. Phila., 1870. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Shark river, New Jersey.

— littoralis (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 212, 213, pl. 28, figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Shark river and Squankum, and doubtfully from Farmingdale, N. J.

— monmouthensis n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 302, 303, pl. 48, fig. 20 [19]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Monmouth and Burlington counties, New Jersey.

Crassatella—Continued.— **monmouthensis** (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 119, 120, pl. 17, figs. 21, 22. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Monmouth, N. J.

— **? parvula** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 202. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Fannin county, Texas.

— **prora** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 43, pl. 1, fig. 8. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— **prora** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 120-121, pl. 17, figs. 10-11. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— **pteropsis** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 279, pl. 46, fig. 9. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Mississippi.

— **pteropsis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 395, pl. 68, fig. 28. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tennessee, and Eufaula, Ala.

— **pteropsis** (Gabb, not Con.) Conrad. (1869.)

Amer. Jour. Conch., vol. 5, Phila., 1869-1870, pp. 47-48. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Tennessee and Alabama; Haddonfield, N. J.; Mississippi.

— **pteropsis** Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 50, pl. 1, fig. 1. Phila., 1872. T. A. Conrad.

Formation: Cretaceous.

— **pteropsis** ? Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 6, pl. 1, fig. 25. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **pteropsis** (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 310. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Georgia; North Carolina.

— **rhombea** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 213, 214, pl. 27, figs. 16-19. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Egypt and Squankum, N. J.

Crassatella—Continued.— **ripleyana** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 327, pl. 35, fig. 3. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, 3 miles north of the town of Ripley, Miss.

— **ripleyana** Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 50 [pl. 1], fig. 7. Phila., 1872. T. A. Conrad.

Formation: Cretaceous.

— **shumardi** n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, pp. 127, 128, pl. 2, figs. 7a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Pope's Well.

— **subplana** n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 274, pl. 24, fig. 9. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Arneytown, N. J.

— **subplana** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 121, 122, pl. 18, figs. 14-16. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Bruere's pits, on Crosswicks creek, near Walnford, and near Cream Ridge, New Jersey.

— **subplana** ? (Con.) Hill. (1889.)

Geol. Sur. Texas, Bull. No. 4, p. 11. Austin, 1889. R. T. Hill.

Formation: Cretaceous.

Location: Two miles north of Webberville, Tex.

— **subquadrata** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. region; Prelim. Rep. Paleont. Black Hills, p. 34. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On Cheyenne river [S. Dakota].

— **subquadrata** Whitfield. (1880.)

Rep. Geol. Black Hills of Dakota, pp. 412, 413, pl. 11, fig. 12. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river [S. Dakota].

— **transversa** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 364, 365. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **transversa** (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 122, 123, pl. 17, figs. 16, 17. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey.

— **tuscan**a (Gabb) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 39, 40, pl. 6, figs. 2-4. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Socia and Waldron islands.

Crassatella—Continued.

- **vadosa** n. s. Morton. (1834.)
 Synop. Org. Rem., Cret. Gr. U. S., p. 66, pl. 13,
 fig. 12. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Prairie Bluff, Alabama.
- **vadosa** (Morton) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, pp. 310, 311.
 Phila., 1876. Wm. M. Gabb.
 Formation: Cretaceous.
- **vadosa** (Mort.) Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, pp. 116, 117, pl. 17
 figs. 12-15. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Holmdel, Freehold, and Burlington,
 N. J.
- **uvasana** n. s. Conrad. (1855.)
 Rep. Expl. and Sur. R. R. R. Miss. River to Pa-
 cific Ocean. App. Prelim. Geol., Rep. of W. P.
 Blake. Pal., p. 9. Wash., 1855. T. A. Conrad.
 Formation: Eocene [Cretaceous].
 Location: Cañada de las Uvas.
- **uvasana** Conrad. (1856.)
 Rep. Expl. and Sur. R. R. R. Miss. River to Pa-
 cific Ocean, vol. 5, App., pp. 320, 321, pl. 2,
 fig. 5. Wash., 1856. T. A. Conrad.
 Formation: Eocene [Cretaceous].
 Location: Cañada de las Uvas.
- **sp. undet.** Owen. (1860.)
 Second Rep. Geol. Rec., Arkansas, pl. 8, fig. 5.
 Phila., 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **sp. undet.** Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 311.
 Phila., 1876. Wm. M. Gabb.
 Formation: Cretaceous.
 Location: Pataula creek, Georgia.
- (**Pachythærus**) **carolinensis** n. s.
 Conrad. (1875.)
 Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875,
 W. C. Kerr., App. A, p. 6, pl. 2, fig. 24. T. A.
 Conrad.
 Formation: Cretaceous.
 Location: Snow Hill, Greene county, North
 Carolina.
- (**Pachythærus**) **evansi** (H. & M.)
 Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 117, 118, pl.
 17, figs. 6a-d. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Near Sage creek, on the Cheyenne [S.
 Dakota].
- Crassatellina** n. g. Meek. (1871.)
 Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pp. 300, 301. Wash., 1871. F. B. Meek.
- **oblonga** n. s. Meek. (1871.)
 Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., p. 301, figs. A and B text. Wash., 1871.
 F. B. Meek.
 Formation: Cretaceous.
 Location: Twelve miles southwest of Salina, Saline
 county, Kansas.

Crassatellina—Continued.

- **oblonga** Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 120, 121,
 pl. 2, figs. 3a-c. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Twelve miles southwest of Salina, Sa-
 line county, Kansas.
- Crenella** (Brown) Conrad. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-
 1860, p. 281. Phila., 1858-1860. T. A. Conrad.
- (Brown) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 75. Wash.,
 1876. F. B. Meek.
- **concentrica** n. s. Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, p. 186, pl. 24, fig.
 169. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Martinez, Cal.
- **elegantula** n. s. M. & H. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, pp. 441, 442.
 Phila., 1862. Meek & Hayden.
 Formation: Cretaceous.
 Location: Deer creek, near north branch Platte
 river [Wyoming]; Yellowstone river, Nebraska
 [Montana].
- **elegantula** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 75, 76, pl. 23,
 figs. 6a-c. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Deer creek, near North Platte [Wyo-
 ming].
- **elegantula** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., p. 181. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Valley of Little Thompson creek, Col-
 orado.
- ? **parvula** n. s. Whiteaves. (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont.,
 vol. 1, pt. 1, p. 57, pl. 9, fig. 1. Montreal, 1885.
 J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Milk River ridge, Canada.
- **serica** n. s. Conrad. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
 1860, p. 281, pl. 46, fig. 23. Phila., 1858-1860.
 T. A. Conrad.
 Formation: Cretaceous.
 Location: Eufaula, Ala.
- Crescis** n. g. G. & H. (1862.)
 Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-
 1863, p. 177. Phila., 1862, 1863. Gabb & Horn.
- **labiata** n. s. G. & H. (1862.)
 Jour. Acad. Nat. Sci., Phil., vol. 5, 2d ser., 1862-
 1863, pp. 177, 178 [pl. 21], fig. 69. Phila., 1862-
 1863. Gabb & Horn.
 Formation: Cretaceous.
 Location: Near Mullica Hill and at Timber creek,
 New Jersey.
- Criocardium** n. subgen. Conrad. (1870.)
 Am. Jour. Conch., vol. 6, Phila., 1870-1871, p. 75.
 Phila., 1871. T. A. Conrad.

Criocardium—Continued.

— (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 214. Wash., 1885. R. P. Whitfield.

— **nucleolus** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 214, 215, pl. 28, figs. 10, 11. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Buckelew and Corliss pits, at Farmingdale, N. J.

Crioceras (d'Orb.) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 266. Phila., 1856. T. A. Conrad.

— **latus** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 76, 77, pl. 15, figs. 25, 25a; pl. 14, fig. 25b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Weaverville, in the Trinity river, Trinity county, California, from a boulder.

— **percostatus** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 77, 78, pl. 16, fig. 26, pl. 17, fig. 26a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Arbuckle's diggings, Shasta county, on the shore of the straits of Carquines, west of Martinez, Cal.

— (**Ammonceras**) **conradi** (Mort.) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 366. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Walnford, Ocean county, New Jersey.

— (**Ancyloceras**?) **rémondi** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 75, 76, pl. 14, figs. 24, 24a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, California.

Cristellaria (Lam.) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band xlv, p. 335. Wien, 1862. A. E. Reuss.

— **alta** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 37. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **baylei** n. s. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band XLIV., Taf. vii, fig. 7. Wien, 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

— **intermedia** var. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band XLIV, p. 336, Taf. viii, fig. 2. Wien, 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

Criocardium—Continued.— **rotulata** (?) (d'Orb.) Schlumberger. (1882.)

Jour. Cincinnati Soc. Nat. Hist., vol. 5, p. 119, pl. 5, figs. 2, 2a. Cincinnati, 1882. C. Schlumberger.

Formation: Cretaceous.

Location: Near Livingston, Ala.

— **sp. undet.** Lyell. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, p. 64, figs. b and c. London, 1845. Charles Lyell.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

Crypta (Humph.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 136. Phila., 1864. W. M. Gabb.

— (**Spirocrypta**) **pileum** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 137, pl. 29, figs. 233, 233a-b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

Cryptorhytis n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 356. Wash., 1876. F. B. Meek.

Ctenoides (Klein.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 329. Phila., 1855-1858. T. A. Conrad.

— **acutilineata** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 329, pl. 34, fig. 2. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **denticulicosta** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 327. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Location: Tennessee.

— **squarrosa** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 366. Phila., 1862. Wm. M. Gabb.

Formation: Cretaceous.

Location: Alabama.

Cucullæa (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 285. New Haven, 1830. S. G. Morton.

— (Lam.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 84. Wash., 1886. F. B. Meek.

— **antrosa** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 65, pl. 13, fig. 6. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

— **capax** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328, pl. 35, fig. 2. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Cucullæa—Continued.

- **exigua** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 275, 276. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Milk river, Nebraska [Montana].
- **haguei** n. s. Meek. (1870.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 134, 135, pl. 12, figs. 1, 1a, b. Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Weber cañon, Wasatch range, Utah.
- **increbescens** n. s. White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 65, pl. 14, figs. 5, 6. Wash., 1889. C. A. White.
Formation: Jurassic.
Location: Kialagvic bay, Alaska.
- **inermis** n. s. Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 271, 272, pl. 36, fig. 18. Phila., 1869. Wm. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **insularis** n. s. Eichwald. (1871.)
Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, p. 168, Taf. 15, figs. 6, 7. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaskan peninsula.
- **maconensis** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 281, pl. 47, fig. 20. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Chunennugga ridge, Macon county, Alabama.
- **matthewsonii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 195, 196, pl. 31, fig. 266. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez; Clayton, Cal.
- **millestriata** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 202. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Red river, Lamar county, Texas.
- **nebrascensis** n. s. Owen. (1852.)
Rep. Geol. Sur. Wis., Iowa, Minn., p. 582, pl. 8, figs. 1, 1a. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Fox hills, between the Cheyenne and Moreau rivers [S. Dakota].
- **neglecta** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 326. Phila., 1862. Wm. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- **terminalis** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 148, pl. 4, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: [Texas.]

Cucullæa—Continued.

- **tippana** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328, pl. 35, fig. 1. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- **transversa** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 326. Phila., 1862. Wm. M. Gabb.
Formation: Cretaceous.
Location: Arneytown? N. J.
- **truncata** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 196, pl. 25, fig. 182. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Curry's; south of Mount Diablo; Tuscan springs, Tehama county; Benicia; Martinez; Texas Flat, Placer county; many points in the coast range, on the east side between Mount Diablo and Pacheco's pass, California; Jacksonville, Oregon.
- **truncata** (Gabb?) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, pp. 38, 39. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia island.
- **vulgaris** n. s. Morton. 1830.
Am. Jour. Sci., 1st ser., vol. 17, p. 285. New Haven, 1830. S. G. Morton.
Formation: [Cretaceous].
Location: United States.
- **vulgaris** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 21. New Haven, 1830. S. G. Morton.
- **vulgaris** Morton. (1830.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 199. Phila., 1827-1831. S. G. Morton.
Formation: [Cretaceous.]
- **vulgaris** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 64, 65, pl. 3, fig. 8; pl. 13, fig. 5. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
- **vulgaris** (Mort.) Emmons. (1858.)
Rep. N. Carolina Geol. Sur., p. 278, fig. B. Raleigh, 1858. E. Emmons.
Formation: Cretaceous.
Location: Black Rock, on the Cape Fear, North Carolina.
- **vulgaris** (Morton) Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 326. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- (**Idonearca?**) **cordata** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 89, 90, pl. 29, figs. 6a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river and Long lake [S. Dakota].

Cucullæa—Continued.

- (*Idonearca*) *nebrascensis* (Owen).
Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 88, 89, pl. 29, figs. 5a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Fox hills and Moreau river [S. Dakota].
- (*Idonearca*) *shumardi* (M. & H.)
Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 86, 87, pl. 28, figs. 15a-g, pl. 29, fig. 4. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Fox hills, Long lake, etc.
- (*Idonearca*) *truncata* (Gabb) Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 165-167, pl. 19, figs. 2, 2a. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: West side of Hornby island, Gabriola island, Nanaimo river, two miles and a half up, and Northwest bay, Vancouver island.
- (*Idonearca*) sp. undet. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 235. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East end of Maud island.
- (*Trigonarca*?) *obliqua* n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 148, 149, pl. 14, figs. 1a, b. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: East Cañon creek, Wasatch range, Utah.
- (Lam.) Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, pp. 44, 45. New Haven, 1820. Thomas Say.
Formation: [Cretaceous].
Location: New Jersey.
- sp. undet. Roemer. (1849.)
Texas, pp. 403, 404. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall, near New Braunfels, Tex.
- sp. undet. Roemer. (1849.)
Texas, p. 404. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- sp. undet. Roemer. (1852.)
Kreide. von Texas, p. 53. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- sp. undet. Roemer. (1852.)
Kreide. von Texas, p. 52, Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New Braunfels, Tex.

Cucullæa—Continued.

- sp. undet. Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 430. Phila., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Dodson's rancho.
- (?) sp. undet. Whiteaves. (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, p. 73. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- (?) sp. undet. Whiteaves. (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 404. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.
- (?) sp. undet. Whiteaves. (1878.)
Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 154. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.
- sp. undet. Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 261. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- sp. undet. Whiteaves. (1882.)
Proc. and Trans. Roy. Soc., Can., vol. 1, sec. 4, p. 85. Montreal, 1883. J. F. Whiteaves.
Formation: Cretaceous.
Location: Jackass mountain, Canada.
- Cultellus** (Con.) Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 303. Phila., 1858-1860. Wm. M. Gabb.
- *cretaceus* n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 303, 304, pl. 48, fig. 25. Phila., 1858-1860. Wm. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, New Jersey.
- Cyclas** subgen. (H. & A. Ad.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 131. Wash., 1876. F. B. Meek.
- *formosa* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 115. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles above Fort Union [N. Dakota].
- *fragilis* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 115. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles above Fort Union [N. Dakota].
- *subellipticus* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 115. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles above Fort Union [N. Dakota].

Cyclomera n. subgen. Conrad. (1866.)

Am. Jour. Conch., vol. 2, p. 78. Phila., 1866.
T. A. Conrad.

Cyclothyris n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1, Raleigh, 1875.
W. C. Kerr., App. A, p. 8. T. A. Conrad.

— **alta** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1, Raleigh, 1875.
W. C. Kerr., App. A, p. 8, pl. 2, fig. 4. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

— **carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1, Raleigh, 1875.
W. C. Kerr., App. A, p. 8, pl. 2, fig. 3. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Cylichna (Loven) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 194. Boston, 1862. B. F. Shumard.

— **costata** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 143, 144, pl. 21, fig. 107. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez; Texas Flat, Placer county; Clayton; Cochran's, east of Mount Diablo; San Diego; Alizos creek, near Fort Tejon, Cal.

— **minuscule** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 195. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Lamar county, Texas.

— **scitula** n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 178. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebraska [S. Dakota].

— **scitula** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 276, 277, pl. 31, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river [S. Dakota].

— **scitula** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of St. Vrain creek and in the valley of the Cache à la Poudre, Colorado.

— **striatella** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, pp. 194, 195. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Navarro county, Texas.

— **?volvaria** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 275, 276, pl. 31, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river [S. Dakota].

Cylichna—Continued.— (*Bulla*) sp. undet. Hill. (1889.)

Geol. Sur. Texas, Bull. No. 4, p. 20. Austin, 1889.
R. T. Hill.

Formation: Cretaceous.

Location: San Antonio, Tex.

Cylindrites (Morris & Lycett) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 115. Phila., 1864. W. M. Gabb.

— **brevis** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 15, pl. 29, fig. 223. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Vicinity of Martinez, Ca.

Cymbophora n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 180. Phila., 1869. W. M. Gabb.

— subgen. (Gabb) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 204. Wash., 1876. F. B. Meek.

— **ashburnerii** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 181. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Typical localities of the Chico, Tejon, and Martinez groups, California.

— **ashburnerii** (Gabb) Whiteaves (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 141, 142, pl. 17, fig. 8. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; Gabriola island; Blunden point, Vancouver island; Protection and Sucia islands.

— **lintea** (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 306. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: [Pataula creek, Georgia?]

— **lintea** Conrad. (1877.)

Proc. Acad. Nat. Sci., Phila., for 1877, p. 24. Phila., 1877. T. A. Conrad.

Formation: Cretaceous.

Location: California, New Jersey, and North Carolina.

Cymella n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur. Smithsonian. Misc. Coll., vol. 7, No. 177, p. 34. Wash., 1864. F. B. Meek.

— (subgen. Meek) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. West of One Hundredth Meridian, vol. 4, pt. 1, p. 187. Wash., 1875. C. A. White.

— **bella** n. s. Conrad. (1875.)

Rep. Geol. Sur. North Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 10, pl. 2, fig. 9. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Cymella—Continued.— **meeki** Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 142, 143, pl. 20, figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Marlborough, Monmouth county, near Keyport, N. J.

— **undata** (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.

Smithson. Misc. Coll., vol. 7, No. 177, p. 34.

Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Idaho.

Cyphosoma (Agas.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 276. Phila., 1869. Wm. M. Gabb.

— **speciosum** n. s. Clark. (1891.)

Johns Hopkins Univ. cir. vol. 10, No. 87, p. 76.

Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous.

Location: New Jersey.

— **texanum** n. s. Roemer. (1852.)

Kreide. von Texas, pp. 82, 83, Taf. 10, figs 6a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg and San Saba valley, Texas.

— **texanum** (Roem.) Hall. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 145, pl. 1, figs. 3a-c. Wash., 1857. James Hall.

Formation: Cretaceous.

Location: Leon Springs, Texas.

— **texanum** (Roem.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 276. Phila., 1869. Wm. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

Cypræa (Linn.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 282. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: Chesapeake and Delaware canal.

— **? bayerquei** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 129, 130, figs. in text. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Clayton, Contra Costa county, California.

— **mortoni** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 391, pl. 68, fig. 8 [9]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Prairie Bluff, Alabama, and Burlington county, New Jersey.

— **(Epona) mathewsonii** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 164, pl. 27, figs. 44a-b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Cypræa—Continued.— **(Luponia) bayerquei** Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 163, 164, pl. 27, figs. 43a-c. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 50. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal.

Cypricardia (Lam.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, p. 176. St. Petersburg, 1871. E. Eichwald.

— **leidyi** n. s. Lea. (1855.)

Proc. Acad. Nat. Sci. Phila., vol. 7, p. 341, pl. 4, fig. 2. Phila., 1856. Isaac Lea.

Formation: [Triassic?]

Location: Near Pottsville, Pa.

— **? texana** n. s. Roemer. (1849.)

Texas, pp. 404, 405. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **texana** Roemer. (1852.)

Kreide. von Texas, pp. 50, 51, Taf. 6, figs. 6a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **(Crassatella) trapezoidalis** (Röm.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halbins. Mang. u. Aleutischen Inseln, pp. 176, 177, Taf. 15, figs. 4, 5. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula.

Cyprimeria n. g. Conrad. (1864.)

Proc. Acad. Nat. Sci., Phila., for 1864, p. 212. Phila., 1864. T. A. Conrad.

— **alta** n. s. Conrad. (1875.)

Rep. Geol. Sur. North Carolina, vol. 1. Raleigh, 1875. W. C. Kerr, app. a, p. 27. T. A. Conrad.

Formation: Cretaceous.

— **? crassa** n. s. Meek. (1876.)

Rep. Expl. Exped., Santa Fe, N. Mex., to junction of Grand and Green rivers, p. 128, pl. 1, figs. 8a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Pope's Well.

— **cretacea** Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 98, pl. 9, fig. 12. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **cretacensis** Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 9. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

— **densata** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 157, 158, pl. 22, figs. 19-21. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Burlington, N. J.

Cyprimeria—Continued.

- **depressa** n. s. Conrad. (1875.)
Rep. Geol. Sur. North Carolina, vol. 1. Raleigh,
1875. W. C. Kerr. App. A, p. 9. T. A. Conrad.
Formation: Cretaceous.
Location: Snow Hill, Greene county, North
Carolina.
- **depressa** (Con.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 308.
Phila., 1876. Wm. M. Gabb.
Formation: Cretaceous.
Location: Georgia.
- **depressa** (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 156, 157, pl. 22,
figs. 11-13. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield and Freehold, N. J.
- **excavata** (Morton) Conrad. (1864.)
Proc. Acad. Nat. Sci., Phila., for 1864, p. 212, fig.
in text. Phila., 1864. T. A. Conrad.
Formation: Cretaceous.
Location: Arneytown, N. J.
- **excavata** (Mort.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 159, 160, pl. 22,
figs. 16, 17. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel and elsewhere in Monmouth
county, New Jersey.
- **heilprini** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 160, pl. 22, figs.
14, 15. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Crosswicks, N. J.
- **lens** (Gabb) Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 152.
Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island; Su-
cia islands.
- **lens** (Gabb) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 42. Wash., 1889.
C. A. White.
Formation: Cretaceous.
Location: Waldron island.
- **spissa** n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869-1870, p.
44, pl. 1, fig. 9. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Crosswicks, N. J.
- **spissa** (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 160, 161, pl. 22,
fig. 18. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel, Monmouth county, New Jer-
sey.
- **? subalata** Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 158, 159, pl. 15, fig. 7. Wash., 1877. F. B.
Meek.
Formation: Cretaceous.
Location: East cañon, Wasatch range, Utah.

Cyprimeria—Continued.

- **? subalata** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **? tenuis** Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2,
No. 4, p. 361, pl. 2, figs. 5, 5a, and 5b. Wash.,
1876. F. B. Meek.
Formation: Cretaceous.
Location: Near Nanaimo, Vancouver's island, and
on Newcastle island.
- **torta** n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 308,
309. Phila., 1876. Wm. M. Gabb.
Formation: Cretaceous.
Location: Georgetown, Ga.
- Cyprina** (Lam.) Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862,
p. 204. Boston, 1862. B. F. Shumard.
- **arenarea** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 143.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Big Sioux river, two miles above the
mouth, Nebraska.
- **compressa** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 144.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota].
- **cordata** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 143.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota].
- **? dallii** n. s. White. (1884.)
Bull. U. S. Geol. Sur. No. 4, p. 14, pl. 6, fig. 1.
Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Fossil Point, Port Möller, Alaska.
- **humilis** n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 179,
180. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: North branch of Cheyenne river, near
Black Hills, Nebraska [S. Dakota].
- **laphami** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p.
204. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Bluffs of Red river, Fannin county,
Texas.
- **occidentalis** n. s. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1,
pt. 3, pp. 227, 228, fig. 10, p. 227. Montreal,
1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Alliford Bay.

Cyprina—Continued.

- **occidentalis** Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 169. Montreal, 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Rocky Mountains, three miles north of the east end of Devil's lake, Northwest Territory.
- **ovata** n. s. M. & H. (1857.)
 Proc. Acad. Nat. Sci., Phila., for 1858, p. 144. Phila., 1858. Meek & Hayden.
 Formation: Cretaceous.
 Location: Mouth of Heart river, Nebraska.
- **ovata** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 146, 147, pl. 29, figs. 7a-c and fig. 8, p. 146. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Mouth of Heart river [S. Dakota].
- **ovata** (M. & H.) Whiteaves. (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 40. Montreal, 1885. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Belly river, near and a little west of the mouth of St. Mary river, also below Horse-shoe bend; St. Mary river, near its confluence with the Belly river; St. Mary river, west of MacLeod-Benton trail; South Saskatchewan, opposite Swift Current creek; Ross Coulee, near Irvine station, on the Canadian Pacific railway, Canada.
- **ovata** (M. & H.) Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 175. Montreal, 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Battle river, township 40, range 13, west of the fourth principal meridian, and township 40, range 15, west of the same meridian, Northwest Territory.
- **ovata** var. **alta** n. var. Whiteaves. (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 40, pl. 5, fig. 3. Montreal, 1885. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Belly river, near and a little west of the mouth of St. Mary river, also below Horse-shoe bend; St. Mary river, near its confluence with the Belly river; St. Mary river, west of MacLeod-Benton trail; South Saskatchewan, opposite Swift Current creek; Ross Coulee, near Irvine station, on the Canadian Pacific railway, Canada.
- **ovata** var. **compressa** Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 147, pl. 30, fig. 11. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
- **subtrapeziformis** Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 176. Montreal, 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Battle river, township 46, range 4, west of the fourth principal meridian, Northwest Territory.

Cyprina—Continued.

- **subtumida** n. s. M. & H. (1857.)
 Proc. Acad. Nat. Sci., Phila., for 1857, p. 144. Phila., 1858. Meek & Hayden.
 Formation: Cretaceous.
 Location: Yellowstone river, Nebraska [Montana].
- **yukonensis** n. s. Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 160, pl. 21, fig. 4. Montreal, 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Rink rapids, on the Lewis river, a tributary of the Yukon, lat. 60° 20', long. 136° 30', Northwest Territory.
- ? **sp. undet.** Roemer. (1849.)
 Texas, p. 407. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Upper course of Pedernales river, Texas.
- ? **sp. undet.** Roemer. (1849.)
 Texas, pp. 406, 407. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Upper course of Pedernales river, Texas.
- **sp. undet.** Roemer. (1852.)
 Kreide. von Texas, p. 47. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: On the upper course of Pedernales river, Texas.
- **sp. undet.** Roemer. (1852.)
 Kreide. von Texas, p. 47. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: On the upper course of Pedernales river, Texas.
- **sp. undet.** Toula. (1874.)
 Die Zwierte Deutsche Nordpolarfahrt. Zweiter Band, p. 505. Leipzig, 1874. Franz Toula.
 Formation: Jurassic [Cretaceous?].
 Location: Kuhn island, east coast of Greenland.
- Cyprinella** n. g. Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, p. 170. Phila., 1864. W. M. Gabb.
- **tenuis** n. s. Gabb. (1864.)
 Geol. Sur. Cal., Paleont., vol. 1, pp. 170, 171, pl. 23, figs. 151, 151a. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: South Side of Corral hollow; Contra Costa county, California.
- Cyprinopsis** n. g. Conrad. (1869.)
 Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 101. Phila., 1870. T. A. Conrad.
- **ovalis** (Gabb) Conrad. (1869.)
 Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 101. Phila., 1870. T. A. Conrad.
 Formation: Cretaceous.
 Location: California.
- Cypris purbeckensis** ? (Forbes) White. (1886.)
 Bull. U. S. Geol. Sur., No. 29, p. 24. Wash., 1886. C. A. White.
 Formation: Jurassic.
 Location: Canyon city, Colo.

Cypris—Continued.

- *sp. undet.* White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 246. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Evanston coal mines, Wyoming.
- *sp. undet.* (Jones) White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 24. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Canyon city, Colo.
- *sp. undet.* (Jones) White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 24. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Canyon city, Colo.

Cyrena (Lamarck) Prime. (1865.)

- Mon. Am. Corbiculadæ (Recent and Fossil). Smithsonian. Misc. Coll., vol. 7, No. 145, pp. 11, 12. Wash., 1865. T. Prime.
- (Lamarck) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 157. Wash., 1876. F. B. Meek.
- *brevidens n. s.* White. (1889.)
Bull. U. S. Geol. Sur., No. 51, pp. 58, 59, pl. 10, figs. 8-11. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Palace Camp, Washington.
- *carletoni n. s.* (Meek) White. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 495, 496. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- *carletoni* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *carletoni* (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 20, 21, pl. 12, figs. 16a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *carletoni* (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 436, pl. 5, figs. 4, 5. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *dakotensis* (M. & H.) Prime. (1865.)
Mon. Am. Corbiculadæ (Recent and Fossil). Smithsonian. Misc. Coll., vol. 7, No. 145, p. 31. Wash., 1865. T. Prime.
Formation: Cretaceous.
Location: At mouth of Big Sioux or Dakotah river.
- *dakotensis* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 159, 160, pl. 1, figs. 1a-f. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of the Big Sioux river, on the Missouri.

Cyrena—Continued.

- *dakotensis* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 436, pl. 4, figs. 3, 4. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southeastern Dakota.
- *? holmesi n. s.* Meek. (1875.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 1, No. 1, 2d ser., pp. 45, 46. Wash., 1875. F. B. Meek.
Formation: Tertiary? [Cretaceous].
Location: Ralston creek, three to four miles north of Golden city, Colo.
- *inflexa* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 290, pl. 10, figs. 7a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near Missouri river, below Gallatin City, Mont.
- *intermedea n. s.* M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 116. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Near Moreau river [S. Dakota].
- *moreauensis n. s.* M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 115, 116. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Near Moreau river [S. Dakota].
- *occidentalis n. s.* M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 116. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Bad Lands of the Judith [Montana].
- *securis* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear River valley, Wyoming.
- *securis* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 250. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyoming.
- *securis* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 289, pl. 3, figs. 2a-c. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyoming.
- (*Corbicula*?) *arkansaensis n. s.* Hill. (1888.)
Ann. Rep. Geol. Sur. Arkansas for 1888, vol. 2, pp. 133, 134, pl. 2, fig. 20; pl. 4, figs. 3, 3a, b. Little Rock, 1888. R. T. Hill.
Formation: Cretaceous.
Location: Arkansas.
- (*Corbicula*?) *cytheriformis n. s.* M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 176. Phila., 1861. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Near the mouth of Judith river, Nebraska [Montana].

Cyrena—Continued.— (**Corbicula**) **durkeei** n. s. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 431.
Phila., 1871. F. B. Meek.
Formation: Tertiary [Cretaceous].
Location: Wyoming.

— (**Veloritina**) **durkeei** (Meek) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of
One Hundredth Meridian, vol. 4, pt. 1, pp. 207,
208, pl. 21, figs. 13a, b. Wash., 1875. C. A. White.
Formation: Eocene? [Cretaceous].
Location: Plateau near the west crossing of the
north fork of Virgin river, at Pace's cañon, and
at the north fork of Virgin river, Utah.

— (**Veloritina**) **erecta** n. s. White. (1876.)

Rep. Geol. Uinta Mts., p. 117. Wash., 1876. C.
A. White.
Formation: Cretaceous.
Location: Upper Kanab, Utah, and Hilliard sta-
tion, Wyoming.

— n. s. Hill. (1889.)

Geol. Sur. Texas, Bull. No. 4, p. 14. Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: Barton's creek, west of Austin, Tex.

Cyrtochilu n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 392. Wash.,
1876. F. B. Meek.

Cytherea [Lam.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 67. Phila.,
1834. S. G. Morton.

— **deweyi** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 83.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota].

— **excavata** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 292, pl. 5, fig.
1. New Haven, 1833. S. G. Morton.
Formation: [Cretaceous].
Location: New Jersey.

— **excavata** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 67, pl. 5, fig.
1. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Arneytown, N. J.

— **leonensis** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pl.
6, fig. 1. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Leon Springs, El Paso road [Texas].

— **missouriana** n. s. Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-
1842, p. 210, pl. 11, fig. 2. Phila., 1839-1842.
S. G. Morton.
Formation: Cretaceous.
Location: Great bend of the Missouri river (lat.
43° 40' N.).

Cytherea—Continued.— **missouriana** (Mort.) Marcon. (1858.)

Geol. N. Am., p. 42. Zurich, 1858. Jules Mar-
cou.
Formation: Cretaceous.
Location: Between Gold mount and the villages
of Galisteo and Algodones, in New Mexico.

— **nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 83.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota].

— **orbiculata** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp.
382, 383, pl. 1, fig. 7. Cambridge and Boston,
1855. Hall & Meek.
Formation: Cretaceous.
Location: On the Missouri, five miles below James
river.

— **owenana** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 273.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebraska
[Montana].

— **pellucida** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 272,
273. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Two hundred miles above mouth of
Milk river, Nebraska [Montana].

— **tenuis** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p.
383, pl. 1, figs. 8a-c. Cambridge and Boston,
1855. Hall & Meek.
Formation: Cretaceous.
Location: On the Missouri, five miles below James
river.

— (**Callista**) **laciniata** (Stoliczka)
Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 148,
pl. 17, figs. 13, 13a; pl. 19, figs. 4, 4a. Mont-
real, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island, Suci-
a islands.

— (**Caryatis**) **plana** (Sow.) Whiteaves.
(1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 149-
151, pl. 17, figs. 14, 14a, b. Montreal, 1879.
J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island; en-
trance to Departure bay, Vancouver island;
Sucia islands.

— **texana** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
153, pl. 6, fig. 2. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera.

— **lamarensis** (Shumard) White.
(1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 39, pl. 18, figs. 4a, b. Wash.,
1883. C. A. White.

Cytherina (Lam.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 335. Phila., 1855-1858. T. A. Conrad.

— **tippana n. s. Conrad. (1858.)**

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 335, pl. 35, fig. 31. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **? White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 213. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colorado.

Dalliconcha n. g. White. (1887.)

Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, pp. 34, 35. Phila., 1887. C. A. White.

— **invaginata n. s. White. (1887.)**

Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, p. 35, pl. 2, figs. 4 and 5. Phila., 1887. C. A. White.

Formation: Cretaceous.

Location: [Four miles north of Fort Worth], Texas.

— **ensifomis (Conrad) White. (1887.)**

Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, pl. 2, fig. 6. Phila., 1887. C. A. White.

Daphnella? (Hinds) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 285. Phila., 1858-1860. T. A. Conrad.

— **? eufaulensis n. s. Conrad. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 285. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **? lintea n. s. Conrad. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 285, 286, pl. 46, fig. 47. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **? subfilosa n. s. Conrad. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 285. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

Delphinula lapidosa n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46, pl. 19, fig. 7. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie Bluff, Ala.

— **? Troost. (1840.)**

Fifth Geol. Rep., Tennessee, p. 56. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: Near Purdy, McNairy county, Tennessee.

Dentalina (d'Orb.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 402. Phila., 1858-1860. Wm. M. Gabb.

Dentalina—Continued.— **(d'Orb.) Reuss. (1861.)**

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band xlv, p. 334. Wien, 1862. A. E. Reuss.

— **americana Ehrenberg. (1854.)**

Mikrogeologie, Taf. 32, fig. 3. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **colligata n. s. Reuss. (1861.)**

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band xli v, pp. 334, 335, Taf. vii, fig. 4. Wien, 1862. A. E. Reuss.

— **confluens n. s. Reuss. (1861.)**

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band xlv, p. 335, Taf. vii, fig. 5. Wien, 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

— **pulchra n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 402, 403, pl. 68, figs. 40, 41. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Near Mullica Hill, N. J.

Dentalium [Linn.] Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 276. Phila., 1850-1854. T. A. Conrad.

— **cooperi n. s. Gabb. (1864.)**

Geol. Sur. Cal., Paleont., vol. 1, p. 139, pl. 21, fig. 100. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: San Diego, Martinez, near Fort Tejon; Curry's, south of Mount Diablo, and in the Siskiyou mountains, California.

— **cooperi (Gabb?) White. (1889.)**

Bull. U. S. Geol. Sur., No. 51, p. 44. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia island.

— **falcatum n. s. Conrad. (1869.)**

Am. Jour. Conch., vol. 5, Phila., 1869-1870, pp. 44, 45, pl. 1, figs. 12-16. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— **fragilis n. s. M. & H. 1856.**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 69. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above mouth, Nebraska [Montana.]

— **gracile (H. & M.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 266, 267, pl. 18, fig. 13a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone River [Montana.]

— **gracile (H. & M.) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of St. Vrain creek and in the valley of the Cache à la Poudre, Colorado.

Dentalium—Continued.

- **gracile** (H. & M.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- **gracile** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dakota, pp. 438, 439, pl. 12, fig. 26. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river near Rapid creek, Black Hills.
- **gracilis n. s.** H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 393, pl. 3, figs. 11a-c. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Sage creek [Wyoming.]
- **komooksense** [**nanaimoensis**] Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 364. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Nanaimo? Vancouver's island.
- **nanaimoense** (Meek) Whiteaves. 1879.
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 133, 134, pl. 16, figs. 9, 9a-b. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Denman island, southwest side; two miles and a quarter up the Nanaimo river, Vancouver island; Sucia island.
- **nanaimoensis n. s.** Meek. (1858.)
Trans. Albany Inst., vol. 4, pp. 44, 45. Albany, 1858-1864. F. B. Meek.
Formation: Cretaceous.
Location: Nanaimo, Vancouver's island.
- **pauperculum n. s.** M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 178. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebraska [S. Dakota.]
- **polygonum** (Reuss) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 238. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **ripleyanum n. s.** Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 393, pl. 68, fig. 17 [pl. 69, fig. 48]. Phila., 1858-1860. Wm. M. Gabb.
Formation: Cretaceous.
Location: Eufaula, Ala.
- **stramineum n. s.** Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 139, 140, pl. 21, fig. 101. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Northeast of Martinez, San Diego; Curry's, south of Mount Diablo, California.

Dentalium—Continued.

- **subarcuatum n. s.** Conrad. (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 276, pl. 24, fig. 13. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: New Egypt, N. J.
- **? subquadratum n. s.** Meek. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 311. Phila., 1861. F. B. Meek.
Formation: Jurassic.
Location: Red Buttes, on the North Platte, lat. 42° 50' north, long. 106° 40' west.
- **? subquadratum** (Meek) M. & H. (1865.)
Paleont., Upper Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 111, fig. 1, text. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: North Platte river, at the Red Buttes, lat. 42° 50' N., long. 106° 40' W.
- **? subquadratum** Meek. (1876.)
Rep. Exp. Great Basin Terr. Utah, p. 357, pl. 3, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Jurassic.
Location: On the North Platte, at Red Buttes, lat. 42° 50' north, long. 106° 40' west.
- (**Ditrupe**?) **pusillum n. s.** Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 139, pl. 21, fig. 99. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Northeast of Martinez, Alizos creek, near Fort Tejon; Tuscan Springs, Cal.
- [**Linn.**] Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, p. 44. New Haven, 1820. Thomas Say.
Formation: [Cretaceous].
Location: Near Mullica Hill, N. J.
- **Morton.** (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 281. New Haven, 1830. S. G. Morton.
Formation: Ferruginous sand [Cretaceous].
Location: Mullica Hill, N. J.
- **sp. undet.** Troost. (1840.)
Fifth Geol. Rep. Tennessee, p. 56. Nashville, 1840. G. Troost.
Formation: Cretaceous.
Location: Near Purdy, McNairy county, Tennessee.
- **Desmatocium n. g.** Gabb. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 518. Phila., 1861. Wm. M. Gabb.
- **trilobatum n. s.** Gabb. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 518. Phila., 1861. Wm. M. Gabb.
Formation: Cretaceous.
Location: Near Mullica Hill, N. J.
(See pl. 69, figs. 39, 39a, Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser.)

Diadema texanum n. s. Roemer. (1849.)

Texas, pp. 392, 393. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg and San Saba river, Texas.

— texanum Roemer. (1852.)

Kreide. von Texas, p. 83, Taf. 10, figs. 5a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg and San Saba valley, Texas.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 84. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, New Braunfels, Tex.

Dianchora (Sow.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 58, 59. Wash., 1885. R. P. Whitfield.

— echinata (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 59, 60, pl. 10, figs. 3-9. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, Freehold, and on Mr. Woodward's farm, Monmouth county, New Jersey.

Diastopora G. & H. (1862.)

Jour. Acad. Nat. Sci., Phil., vol. 5, 2d ser., 1862-1863, p. 171. Phila., 1862-1863. Gabb & Horn.

— lineata n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-1863, p. 172 [pl. 21], fig. 62. Phila., 1862-1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek and Mullica Hill, N. J.

Diceras (Lam.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 131. Wash., 1885. R. P. Whitfield.

— dactyloides n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 131, pl. 18, figs. 26, 27. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Bruere's pits near Walnford, on Crosswicks creek, Monmouth county, New Jersey.

— sp. undet. Roemer. (1849.)

Texas, p. 404. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Slope of plateau near New Braunfels, Tex.

— sp. undet. Roemer. (1852.)

Kreide. von Texas, p. 53. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Slope of the plateau, near New Braunfels, Tex.

Dimorphina saxipara Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 27. Leipzig, 1854. O. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Dione (Gray) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 302. Phila., 1858-1860. Wm. M. Gabb.

— (subgen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 178. Wash., 1876. F. B. Meek.

— delawarensis n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 302, pl. 48, fig. 19 [18]. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal and New Jersey.

Diploconcha n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr., App. A, p. 12. T. A. Conrad.

— cretacea n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875, W. C. Kerr., App. A, p. 12, pl. 2, fig. 26. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, North Carolina.

Diplodon (subgen. Spix.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Diplopodia malbosi (Desor) Cotteau. (1890.)

Bull. Soc. Géol., France, 3d ser., vol. 18, p. 294. Paris, 1890. Cotteau.

Formation: Cretaceous.

Location: Valley of Arivechi, Sonora, Mexico.

Diploschiza n. g. Conrad. (1866.)

Am. Jour. Conch., vol. 2, p. 77. Phila., 1866. T. A. Conrad.

— cretacea n. s. Conrad. (1866.)

Am. Jour. Conch., vol. 2, p. 77, pl. 3, figs. 2, 3. Phila., 1866. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama.

— cretacea (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 43, 44, pl. 4, figs. 4-8. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Upper Freehold, N. J.

Diptychoceras n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 143. Phila., 1869. W. M. Gabb.

— laevis n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 144, 145, pl. 25, figs. 21a-b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, California.

Discina (Lam.) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 99. Wash., 1877. F. B. Meek.

Discina—Continued.— **pileolus** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 159, pl. 21, figs. 3, 3a. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rink Rapid, on the Lewes river, a tributary of the Yukon, lat. 60° 20', long. 136° 30', Northwest Territory.

— **semipolita** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 352-354, pl. 33, figs. 9, 9a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

— **vancouverensis** n. s. Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 177, pl. 20, fig. 6. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Southeast of Ganges harbor, on Salt Spring or Admiralty island.

— **sp. undet.** Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 99, 100, pl. 10, figs. 3, 3a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Weber cañon, Wasatch range.

Discites (subgen. De Haan.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 491. Wash., 1876. F. B. Meek.

Discohelix (Dunker) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 119. Phila., 1864. W. M. Gabb.

— **leana** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, pp. 119, 120, pl. 20, fig. 75. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas Flat, Placer county, California.

Discoidea (Agas.) Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 40. Phila., 1850-1854. T. A. Conrad.

— **occidentale** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 398, pl. 68, figs. 42-44. Phila., 1858-1860. Wm. M. Gabb.

Formation: Cretaceous.

Location: Oregon.

— **occidentalis** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 323, 324. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Oregon? Or may be from Peru.

Discorbina globularis (d'Orb.) Dawson. (1874.)

Canadian Naturalist, vol. 7 n. ser., p. 255, fig. 1, c, p. 253. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: About twenty miles north of the forty-ninth parallel, on the escarpment called Pembina mountain, Manitoba.

Discoscaphites n. subgen. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429. Phila., 1871. F. B. Meek.

Ditaxia compressa (Goldf.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 220. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Timber creek, New Jersey.

Donax (Linn.) Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 183. Phila., 1869. W. M. Gabb.

— **fordii** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 102, pl. 9, fig. 25. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **fordii** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 171, 172, pl. 23, fig. 1. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **latus** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 183, 184, pl. 30, fig. 75. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Ten miles west of Griswold's, southeast of the Sheep Well, on the road from San Juan to New Idria, Cal.

Dosinia (Scopoli) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 325. Phila., 1855-1858. T. A. Conrad.

— **alta** n. s. Conrad. (1855.)

Rep. Expl. and Sur. R. R. R. Miss. river to Pacific Ocean. App. Prelim. Geol. Rep. of W. P. Blake. Pal., p. 9. Wash., 1855. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— **alta** Conrad. (1856.)

Rep. Expl. and Sur. R. R. R. Miss. river to Pacific Ocean, vol. 5, App., p. 320, pl. 2, fig. 2. Wash., 1856. T. A. Conrad.

Formation: Eocene [Cretaceous].

Location: Cañada de las Uvas.

— **densata** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 325, pl. 34, fig. 13. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **depressa** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 278, pl. 46, fig. 6. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **elevata** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 167, pl. 30, fig. 252. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

Dosinia—Continued.— **? erecta** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 162, 163, pl. 18, figs. 17-20. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Upper Freehold and near Marshallville, N. J.

— **gabbi** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 161, 162, pl. 22, figs. 4, 5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Burlington and Freehold, N. J.

— **gyrata** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 168, pl. 23, fig. 148. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Marsh's; southeast of Mount Diablo; Martinez; near San Diego; near the mouth of the Cañada de las Uvas; at Alizos creek, California.

— **gyrata** (Gabb.) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 151. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— **haddonfieldensis** n. s. Lea. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 149. Phila., 1862. Isaac Lea.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **inflata** n. s. Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 168, pl. 23, fig. 149. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Chico creek, Butte county, California.

— **jurassica** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur., Rocky Mt. region; Prelim. Rep., Paleont., Black Hills, pp. 23, 24. Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: Two miles south of Belle Fourche; and also on the east side of Spearfish creek, near junction with the Redwater, northeast of Crow peak, Black hills, [S.] Dakota.

— **jurassica** Whitfield. (1880.)

Rep. Geol. Black Hills of Dakota, p. 373, pl. 5, figs. 21-24. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of Belle Fourche; and also on the east side of Spearfish creek, near junction with the Redwater, Black hills.

— **missouriana** ? (Morton) Whitfield. (1880.)

Rep. Geol. Black Hills of Dakota, pp. 416, 417, pl. 11, figs. 25, 26. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, ten or fifteen miles west of the mouth of Beaver creek, Black hills.

— **obliquata** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 278, pl. 46, fig. 2. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Mississippi.

Dosinia—Continued.— **pertenuis** n. s. Gabb. (1864.)

Geol. Sur., Cal., Paleont., vol. 1, pp. 167, 168, pl. 30, fig. 253. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North side of Siskiyou mountains, in southern Oregon.

— **? tenuis** n. s. Meek. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 315. Phila., 1862. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **tenuis** ? (Meek) Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 264, pl. —, fig. 5. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Protection island.

— **Conrad.** (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 8. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

Dosiniopsis ? (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 179. Wash., 1876. F. B. Meek.

Dreissena (Van Beneden) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328. Phila., 1855-1858. T. A. Conrad.

— **tippana** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328, pl. 34, fig. 14. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Drepanocheilus n. subgen. Meek. (1864.)

Check List Invert. Foss. N. Am., Cat. and Jour. Smithson. Misc. Coll., vol. 7, No. 177, p. 35. Wash., 1864. F. B. Meek.

Dropanochilus subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 324. Wash., 1876. F. B. Meek.

Drillia (Gray) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331. Phila., 1855-1858. T. A. Conrad.

— **? distans.** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 286, pl. 46, fig. 49. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **georgiana** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 280, 281. Phila., 1876. Wm. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Clay county, Ga.

— **novemcostata** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 231, pl. 35, fig. 13. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, 3 miles north of the town of Ripley, Miss.

Drillia—Continued.— **? tippana** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331, pl. 35, fig. 5. Phila., 1855-1858.
T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, 3 miles north of the town of Ripley, Miss.

Dysnomya (subgen. Ag.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Echinus (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

— **infulatus** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig. 7. New Haven, 1833. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: South Carolina.

— **infulatus** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 75, pl. 10, fig. 7. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: South Carolina.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 287. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: United States.

Edmondia (De Koninck) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, p. 283. Wash., 1877. Hall & Whitfield.

— **myrina** n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, p. 283, pl. 6, fig. 19. Wash., 1877. Hall & Whitfield.

Formation: Triassic.

Location: Dun glen, Pah-Ute range, Nev.

Egeta (subgen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 157. Wash., 1876. F. B. Meek.

Electroma (Stoliczka) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 29. Wash., 1876. F. B. Meek.

Ellipsosmilia (subgen. d'Orb.) Gabb. (1864.)

Geol. Sur. Cal., Paleont., vol. 1, p. 208. Phila., 1864. W. M. Gabb.

Emarginula (Lam.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 140. Phila., 1864. W. M. Gabb.

— **radiata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 140, pl. 21, figs. 102, 102a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

Embudo sp. undet. Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo 3, p. 657, Lam. 1, fig. 12. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojada, Mexico.

Enallaster d'Orb. (1853.)

Paleont. Francaise, Echinoides Irreguliers, Terr. Cret. t. Sixieme, pp. 181-183. Paris, 1853-1860. A. d'Orbigny.

— (d'Orb.) Desor. (1858.)

Synop. Echinides Foss., p. 357. Paris and Wiesbade, 1858. E. Desor.

— **mexicanus** n. s. Cotteau. (1890.)

Bull. Soc. Geol. France, 3d ser., vol. 18, pp. 296-298, pl. 2. Paris, 1890. Cotteau.

Formation: Cretaceous.

Location: Guadalupe, state of Chihuahua, and Colima, Mexico.

— **texasus** (Roemer sp.) d'Orb. (1853.)

Paleont. Francaise Echinoides Irreguliers, Terr. Cret. t. Sixieme, pp. 184-186, pl. 850. Paris, 1853-1850. A. d'Orbigny.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **texanus** (Roemer sp.) Desor. (1858.)

Synop. Echinides Foss., p. 358. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Enclimatoceras (Hyatt) White. (1884.)

Bull. U. S. Geol. Sur., No. 4, pp. 16, 17. Wash., 1884. C. A. White.

— (**Nautilus**) **ulrichi** White. (1884.)

Bull. U. S. Geol. Sur., No. 4, p. 17, pls. 7-9. Wash., 1884. C. A. White.

Formation: Cretaceous [Tertiary].

Location: Near Little Rock, Ark.

Encrinites and Bryozoa. (1854.)

Rep. Expl. and Sur. P. R. R., Mississippi River to Pacific Ocean, vol. 2; Rep. Expl. Forty-first Parallel N. Lat., p. 109, pl. 1, fig. 12. Wash., 1855. James Schiel.

Formation: Cretaceous.

Location: Indian creek.

Endocostea n. g. Whitfield. (1877.)

U. S. Geog. and Geol. Sur. Rocky Mt. Region, Prelim. Rep. Paleont., Black Hills, pp. 31, 32. Wash., 1877. R. P. Whitfield.

— **sulcata** (Roem.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 404, 405, pl. 10, fig. 6. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Loose, on the east fork of Beaver creek, Black hills.

— **typica** n. s. Whitfield. (1877.)

U. S. Geog. and Geol. Sur. Rocky Mt. Region, Prelim. Rep. Paleont., Black Hills, pp. 32, 33. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: Old Womans Fork of the Cheyenne river, Black hills, Dak.

— — Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 403, 404, pl. 9, figs. 1-7. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Old Womans fork of the Cheyenne river, Black hills.

Endoptygma n. g. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 302.
Phila., 1876. Wm. M. Gabb.

— **umbilicata** (Tuomey sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 302,
pl. 17, figs. 8 and 9. Phila., 1876. Wm. M.
Gabb.

Formation: Cretaceous.

Location: Mississippi and Alabama.

(=Pholus umbilicata Tuomey.)

Entalis (Sow.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 267, 268.
Wash., 1876. F. B. Meek.

— **cooperi** (Gabb sp.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 138.
pl. 16, figs. 10, 10a. Montreal, 1879. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island, two
miles and a quarter up the Nanaimo river, and
lower part of the Trent river, Vancouver is-
land.

— **? paupercula** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 269, pl. 18,
fig. 14. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **paupercula** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pa-
leont., vol. 1, pt. 1, p. 81. Montreal, 1885. J.
F. Whiteaves.

Formation: Cretaceous.

Location: Milk river, at the mouth of Pa-kow-ki
coulee, Canada.

Entalaphora n. g. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-
1863, p. 170. Phila., 1862, 1863. Gabb & Horn.

— **conradi** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862-
1863, p. 170 [pl. 21], fig. 59. Phila., 1862-1863.
Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

— **quadrangularis** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 170, pl. 21, fig. 58. Phila., 1862, 1863.
Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, and probably near Mul-
lica hill, N. J.

Entolium n. subgen. Meek. (1865.)

Geol. Sur. Cal. Geol., vol. 1, p. 478. Phila., 1865.
F. B. Meek.

Epona (subgen. H. & A. Ad.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 164. Phila.,
1869. W. M. Gabb.

Eripachya n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 148, 149.
Phila., 1869. W. M. Gabb.

— **hoffmannii** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 149. Phila.,
1869. W. M. Gabb.

— **perforata** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 149. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— **ponderosa** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 149. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan or Lick springs, Pence's ranch,
Butte county, Cal.

Eriphyla n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 180. Phila.,
1864. W. M. Gabb.

— **gregaria** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 124-126,
pl. 17, figs. 9 a-b, figs. 6, 7, p. 124. Wash., 1876.
F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and
fifty miles above its mouth.

— **umbonata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 180, pl. 24, figs.
162, 162a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cow creek, Shasta county; Curry's,
south side of Mount Diablo, Cal.

— **umbonata** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 151,
152. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, two miles and a quar-
ter up and at the Sucia islands.

Eschara (Lam.) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser.,
1827-1831, p. 124. Phila., 1827-1831. S. G.
Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county,
N. J.

— **digitata** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 79, pl. 13,
fig. 8. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

— **digitata** (Mort.) Lonsdale. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, pp. 73-75,
figs. a 9, p. 73. London, 1845. William Lons-
dale.

Formation: Cretaceous.

Location: Timber creek, N. J.

— **digitata** (Mort.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 114, 115. Phila., 1862, 1863. Gabb &
Horn.

Formation: Cretaceous.

Location: Timber creek and near Mullica hill,
N. J.

Eschara—Continued.— **dichotoma** (Goldf.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 218, 219.

Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Near Brownville, N. J.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New

Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location: Gloucester county, N. J.

— **sp. undet.** Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 2. Austin, 1889.

R. T. Hill.

Formation: Cretaceous.

Location: Texas.

Escharina sagena (Mort. sp.) Lonsdale. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, pp. 71, 72,

figs. a-c, p. 71. London, 1845. William Lonsdale.

Formation: Cretaceous.

Location: Timber creek, N. J.

Escharinella muralis n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 140 [pl. 19], fig. 23. Phila., 1862, 1863.

Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

— (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 140. Phila., 1862, 1863. Gabb &

Horn.

Escharifora (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 134. Phila., 1862, 1863. Gabb &

Horn.

— **typica** (G. & H. sp.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, pp. 134, 155 [pl. 19], fig. 16. Phila., 1862,

1863. W. M. Gabb.

Formation: Cretaceous.

Location: Timber creek and Mullica hill, N. J.

Escharipora (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 148. Phila., 1862, 1863. Gabb &

Horn.

— **abbottii** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 149 [pl. 20], fig. 33. Phila., 1862, 1863.

Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

— **distans** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, pp. 148, 149 [pl. 20], fig. 32. Phila., 1862,

1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, N. J.

Escharipora—Continued.— **immersa** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, pp. 149, 150. Phila., 1862, 1863. Gabb &

Horn.

Formation: Cretaceous.

Location: Timber creek, N. J.

Estheria bellula n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont.,

vol. 1, pt. 2, pp. 162, 163, pl. 21, figs. 7, 7a.

Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rink rapids, on the Lewes river, a

tributary of the Yukon, lat. 60° 20' long. 136°

20', Northwest Territory.

— **ovata** (Lea) Jones. (1862.)

Paleontographical Society, pp. 84-99, pl. 2, figs.

26-28. London, 1862. T. R. Jones.

Formation: Triassic?

Location: Blackheath, near Richmond, Va., Dan

river and Chatham county, N. C., Phoenix-

ville, Pa.

— **ovata** (Lea. sp.) Jones. (1862.)

Quart. Jour. Geol. Soc., London, vol. 19, pp. 151-

153. London, 1863. T. R. Jones.

Formation: Lower Mesozoic.

Location: North and South Carolina, Eastern

Virginia, Pennsylvania.

Etea n. g. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875.

W. C. Ken., App. A, pp. 5, 6. T. A. Conrad.

— **carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875.

W. C. Ken., App. A, p. 6, pl. 1, fig. 14. T. A.

Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Ethmocardium n. subgen. White. (1879.)

Proc. U. S. Nat. Mus., vol. 2, pt. 2, pp. 291, 293.

Wash., 1890. Smithsonian. Misc. Coll., vol. 19.

Wash., 1880. C. A. White.

Eudea (Lam.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 320.

Phila., 1862. W. M. Gabb.

— **dichstoma** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 330.

Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Near Mullica hill, and at Blackwoods-

town, N. J.

Eudiscoceras n. g. Hyatt. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p.

128. Wash., 1877. Alpheus Hyatt.

— **gabbi** n. s. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp.

128, 129, pl. 11, figs. 3, 3a. Wash., 1877. F. B.

Meek.

Formation: Triassic.

Location: Cottonwood canyon, West Humboldt

range, Nev.

Eulima (Risso) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 170.
Phila., 1870. T. A. Conrad.

— **? chrysalis n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr. p.
506. Wash., 1872. F. B. Meek.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville,
Utah.

— **funicula n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
p. 506. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— **? inconspicua n. s. Meek. (1873.)**

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
p. 507. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville,
Utah.

— **? inconspicua (Meek) White. (1883.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 33, pl. 12, fig. 5a. Wash., 1883.
C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, Coalville, Utah.

— **(?) subfusiformis n. s. Shumard. (1853.)**

Expl. Red River Louisiana, by R. B. Marcy, p. 203,
pl. 4, fig. 3. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Camp No. 4, Cross Timbers, Tex.

— **(?) texana n. s. Roemer. (1849.)**

Tex., p. 413. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— **(?) texana Roemer. (1852.)**

Kreide von Tex., p. 40, Taf. 4, fig. 2. Bonn, 1852.
F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below
New Braunfels, Tex.

Eulimella (Forbes) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, p. 197. Wash.,
1875. C. A. White.

— **? chrysalis (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **(?) chrysalis (Meek) White. (1883.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 32, 33, pl. 12, fig. 4a. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, Coalville, Utah.

— **funicula (Meek) White. (1875.)**

Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, p. 197, pl. 18,
fig. 6a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: North Fork of Virgin river, Utah.

Eulimella—Continued.— **? funicula (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **funicula (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 316, 317, pl. 9, fig. 10a. Wash., 1876.
C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **inconspicua (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Eumicrotis n. g. Meek. (1864.)

Am. Jour. Sci., 2d ser., vol. 37, pp. 218, 219. New
Haven, 1864. F. B. Meek.

— **curta (Hall) M. & H. (1865.)**

Paleont., Up. Missouri, Smithsonian. Cont. Knowl.,
vol. 14, No. 182, p. 81. pl. 3, figs. 10. a-d.
Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base Black hills.

— **curta (Hall) H. & W. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
p. 289, pl. 7, fig. 24. Wash., 1877. Hall &
Whitfield.

Formation: Jurassic.

Location: Ashley creek, Uinta range, Utah.

— **curta (?) (M. & H.) Whiteaves. (1878.)**

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 403.
Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Itasyouco river.

— **curta (?) (M. & H.) Whiteaves. (1878.)**

Geol. Sur. Can. Rep. Prog. for 1876-1877, pp. 152,
153. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Itasyouco river, British Columbia.

Euspira (Ag.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 160. Phila.,
1869. W. M. Gabb.

— **alveata (Con. sp.) Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, p. 160. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— **coalvillensis White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **coalvillensis White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 310, pl. 4, figs. 2a, b. Wash., 1879.
C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Euspira—Continued.— **tabulata** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 260, pl. 32, fig. 4. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— **utahensis** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 29. Wash., 1883. C. A. White.

(E. coalvillensis, Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 237, 253 and 310, by mistake.)

Eutomoceras n. g. Hyatt. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 126. Wash., 1877. Alpheus Hyatt.

— **laubei** n. s. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 126-128, pl. 10, figs. 8, 8a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: New Pass, Desatoya mountains, Nev.

Exilifusus n. subgen. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 278, 279. Phila., 1876. W. M. Gabb.

Exogyra n. g. Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 43. New Haven, 1820. Thomas Say.

— **arietina** n. s. Roemer. (1849.)

Texas, pp. 397, 398. Bonn, 1849. Roemer.

Formation: Cretaceous.

Location: Waco camp and Mission hills, near New Braunfels, springs of San Marcos river and Brazos river, above Torrey's trading house.

— **arietina** Roemer. (1852.)

Kreide von Texas, p. 68, Taf. 8, figs. 10a-e. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp above New Braunfels, Mission hills, springs of San Marcos river, upper Brazos, above Torrey's trading house, and near Austin, Tex.

— **arietina** (Roem.) Conrad. (1854.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 153, pl. 7, figs. 1a-e. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon springs.

— **arietina** (Roem.) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., pp. 303, 304, pl. 51, figs. 3-5. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Texas.

— **aquila** (Gold.) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 304, pl. 53, figs. 1, 2. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Bell county, Tex.

— **auricularis** (Wahl.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 230, 231. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Near Woodbury, N. J.

Exogyra—Continued.— **caprina** n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2 ser., 1850-1854, p. 273, pl. 24, figs. 3, 4. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: San Felipe creek, near Rio Grande, Western Tex.

— **columbella** n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, pp. 124, 125, pl. 1, figs. 3a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Covero; Sierra Abajo; Galisteo, New Mexico.

— **columbella** (Meek) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 304, pl. 55, figs. 5, 6. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Southern Utah and adjacent parts of New Mexico.

— **costata** n. s. Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 43. New Haven, 1820. Thomas Say.

Formation: Cretaceous.

Location: New Jersey.

— **costata** (Say) Morton. (1828.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 85-88, pl. 6, figs. 1-4. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Delaware; well near Eutaw springs, S. C.

— **costata** (Say) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 284. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey to South Carolina.

— **costata** (Say) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 55, 56, pl. 6, figs. 1-4. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey, Delaware, South Carolina, Alabama, Tennessee, and Arkansas.

— **costata** (Say) Troost. (1840.)

Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: McNairy county, Tenn.

— **costata** (Say) Roemer. (1849.)

Tex., p. 396. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Colorado river, near Austin, Tex.

— **costata** (Say) Roemer. (1852.)

Kreide von Texas, p. 72. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: On the Colorado river, near Austin, Tex.

— **costata** (Say) Conrad. (1854.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 154, 155, pl. 9, figs. 1, 2; pl. 10, fig. 1; pl. 8, fig. 3. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Eocene locality, Jacun, three miles below Laredo, Mexico.

Exogyra—Continued.

- **costata** var. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 154, pl. 8, fig. 2. Wash., 1859. T. A. Conrad.
Formation: Cretaceous.
Location: Texas.
- **costata** (Say) Emmons. (1858.)
Rep. N. Carolina Geol. Sur., p. 278, fig. 4. Raleigh, 1858. E. Emmons.
Formation: Cretaceous.
Location: Black rock on the Cape Fear, and at Rocky point, twenty miles north of Wilmington, N. C.
- **costata** (Say) Owen. (1860.)
Second Rep. Geol. Rec., Ark., pl. 7, fig. 4. Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.
- **costata** (Say) Cook. (1868.)
Ann. Rep. Geol. Sur. N. J., for 1868, p. 374, fig. —, p. 374. Newark, 1868. G. H. Cook.
Formation: Cretaceous.
Location: New Jersey.
- **costata** (Say) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 323. Phila., 1876. Wm. M. Gabb.
Formation: Cretaceous.
Location: Georgetown, and five miles north of Lumpkin, Stewart county, Ga.
- **costata** (Say) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 304, pl. 51, figs. 1, 2; pl. 57, figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **costata** (Say) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 39-41, pl. 6, figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Nearly all the localities of the lower marl beds of the Cretaceous in New Jersey.
- **costata** var. **fluminis** n. var. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 174, 175, pl. 17, figs. 3a-d. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: East bank of the Rio Puerco, six miles below Casa Salazan, N. M.
- **fimbriata** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 269. Phila., 1856. T. A. Conrad.
Formation: Cretaceous.
Location: Texas.
- **fimbriata** Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 154, pl. 7, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Western Texas.
- **fimbriata** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 305. Wash., 1884. C. A. White.
Formation: Cretaceous.

Exogyra—Continued.

- **flabellata** (Goldf.) Marcou. (1858.)
Geol. N. Am., pp. 41, 42. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Cross Timbers, Fort Arbuckle; headwaters of the Rio Colorado, Tex., and the vicinity of Fredericksburg and New Braunfels.
- **forniculata** n. s. White. (1879.)
Proc. U. S. Nat. Mus., vol. 2, pt. 2, pp. 293, 294, pl. 4, fig. 384. Wash., 1880. Smithsonian. Misc. Coll., vol. 19. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Bexar county, Tex.
- **forniculata** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pl. 14, figs. 2a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Bexar county, Tex.
- **forniculata** White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 305, pl. 52, figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **fragosa** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 269. Phila., 1856. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera [Tex.].
- **fragosa** Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pl. 8, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera.
- **fragosa** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 305. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **interrupta** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 330, pl. 34, fig. 15. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- **interrupta** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 305. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Mississippi.
- **laciniata** (Goldf.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 229, 230. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Near Woodbury, N. J.
- **læviuscula** n. s. Roemer. (1849.)
Tex., p. 398. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Crossing of the Cibola between New Braunfels and San Antonio, Tex.

Exogyra—Continued.

- *laeviuscula* Roemer. (1852.)
Kreide von Tex., pp. 70, 71, Taf. 9, figs. 3a-c.
Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Crossing of the Cibolo between New Braunfels and San Antonio, Tex.
- *laeviuscula* (Roem.) Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 154, pl. 7, figs. 4a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Leon springs.
- *laeviuscula* (Roem.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one hundredth meridian, vol. 4, pt. 1, pp. 173, 174, pl. 17, figs. 2a-d. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Linear Plateau, Southeastern Utah.
- *laeviuscula* (Roem.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 305, 306, pl. 52, figs. 3-5. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas and New Mexico.
- *matheroniana* (d'Orb.) Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 154, pl. 8, figs. 1a, b, pl. 11, figs. 1a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera.
- *matheroniana* (d'Orb.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 306. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- *parasitica* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 205, pl. 26, figs. 192, 192a, b, pl. 31, figs. 273, 273a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, opposite Folsom; Cottonwood creek, Shasta county, Cal.
- *parasitica* (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 306, pl. 55, figs. 3, 4. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: California.
- *planospirites* (Goldf.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 231. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.
- *plicata* (Lam. sp.) Gabb. (1869.)
Geol. Sur., Cal. Paleont., vol. 2, p. 275, pl. 36, figs. 19, 19a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

Exogyra—Continued.

- *plicata* (Goldf.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 228, 229. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Middletown, Nut swamp, Marlboro, N. J.
- *plicata* (Lam.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 306. Wash., 1884. C. A. White.
Formation: Cretaceous.
- *ponderosa* n. s. Roemer. (1849.)
Texas, pp. 395, 396. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Many places near New Braunfels, especially in ravine on the road to Seguin, Tex.
- *ponderosa* Roemer. (1852.)
Kreide von Tex., pp. 71, 72, Taf. 9, figs. 2a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of the Guadalupe, New Braunfels, and ravine three miles from New Braunfels on road to Seguin, Tex.
- *ponderosa* (Roem.) Shumard. (1853.)
Expl. Red River, Louisiana, by R. B. Marcy, p. 204. Wash., 1853. B. F. Shumard.
Formation: Cretaceous.
Location: Fort Washita, Ind. T.
- *ponderosa* (Roem.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 229. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Nut swamp, N. J.
- *ponderosa* (Roem.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one hundredth meridian, vol. 4, pt. 1, pp. 172, 173, pl. 14, figs. 1a-c. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: East of Impracticable ridge, Utah.
- *ponderosa* (Roem.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 306, pl. 50, figs. 1-3. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Gulf States.
- *texana* n. s. Roemer. (1849.)
Tex., pp. 396, 397. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Hills near Fredericksburg, San Saba river, near Waco camp, etc.
- *texana* Roemer. (1852.)
Kreide von Tex., pp. 69, 70, Taf. 10, figs. 1a-e. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, San Saba valley, on road from New Braunfels to Fredericksburg and near the Waco camp on the Guadalupe above New Braunfels.
- *texana* (Roem.) Shumard. (1853.)
Expl. Red river, Louisiana, by R. B. Marcy, p. 205, pl. 5, figs. 1a, b. and fig. 5. Wash., 1853. B. F. Shumard.
Formation: Cretaceous.
Location: Camp No. 4, Cross timbers, Tex.

Exogyra—Continued.

- **texana** (Roem.) Blake. (1855.)
Rep. Expl. and Sur. P. R. B. Mississippi river to Pacific ocean, vol. 2; Rep. Geol. thirty-second parallel, p. 39. Wash., 1855. W. P. Blake.
Formation: Cretaceous.
Location: From the banks of Red river near Preston; from the Big springs of the Colorado.
- **texana** (Roem.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 306, pl. 51, figs. 1-5. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **valkeri** n. s. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 278, pl. 1, figs. 1a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Salado, Bell county, Tex.
- **walkeri** White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 307, pl. 54, figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **winchelli** n. s. White. (1879.)
Proc. U. S. Nat. Mus., vol. 2, pt. 2, pp. 294, 295, pl. 2, figs. 1, 2, pl. 3, figs. 1, 2. Wash., 1880. Smithsonian. Misc. Coll., vol. 19. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Collin county, Tex.
- **winchelli** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 12, pl. 13, figs. 1 a-d. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Collin county, Tex.
- **winchelli** White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 307, pl. 55, figs. 6, 7; pl. 56, figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Gulf States.
- **sp. undet.** Troost. (1840.)
Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G. Troost.
Formation: Cretaceous.
Location: McNairy county, Tenn.
- **sp. undet.** Roemer. (1852.)
Kreide von Tex., p. 72. Bonn., 1852. F. Roemer.
Formation: Cretaceous.
Location: Waco camp on the Guadalupe above New Braunfels, Tex.
- **sp. undet.** Roemer. (1852.)
Kreide von Tex., p. 73. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waco camp, on the Guadalupe above New Braunfels, Tex.
- **sp. undet.** Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 175. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Entrance to Departure bay, Vancouver island.

Exogyra—Continued.

- **sp. undet.** Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 165. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rocky mountains, three miles north of the east end of Devils lake, Northwest Territory.
- Fasciolaria** (Lam.) Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 390. Phila., 1858-1860. W. M. Gabb.
- (Lam. typical) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 355. Wash., 1876. F. B. Meek.
- **buccinoides** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 67. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau and Fox hills, Nebr.
- **buccinoides** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 358, 359, pl. 31, figs. 8a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river and Long lake.
- **cretacea** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 66, 67. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river and Fox hills, Nebr.
- **? io** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 101, 102, pl. 28, fig. 214. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.
- **? læviuscula** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, pp. 100, 101, pl. 18, fig. 55. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Below coal in the Mount Diablo district, San Diego and Martinez; Bulls Head point, Hill mine, near Clayton, Cal.
- **? nodulosa** n. s. Whiteaves. (1874.)
Geol. Sur. Can.; Rep. Prog. for 1873-74, p. 263. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two and a quarter and two and a half miles up.
- **nodulosa** Whiteaves. (1874.)
Geol. Sur. Can.; Rep. Prog. for 1873-74, p. 263. Montreal 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Protection island.
- **nodulosa** Whiteaves. (1874.)
Geol. Sur. Can.; Rep. Prog. for 1873-74, p. 268, pl. —, figs. 7, 7a, b. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two and a quarter miles up; Protection island.

Fasciolaria—Continued.— **saffordi** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 390, pl. 68, fig. 6. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tenn.

— **sinuata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 101, pl. 28, fig. 213a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon; San Diego, Cal.

— **slackii** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 322. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— **slackii** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 282. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **(Cryptorhytis) cheyennensis** (M. & H. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 365, 366, pl. 19, figs. 13a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: South fork of Cheyenne river, near the Black hills.

— **(Cryptorhytis) contorta** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 422, 423, pl. 12, fig. 10. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman fork of the Cheyenne river, Wyo.

— **(Cryptorhytis) crassicosta** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 282, 283. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— **(Cryptorhytis) flexicostata** (M. & H. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 367, 368, pl. 19, fig. 2, and fig. 46 p. 367. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

— **(Cryptorhytis) fusiformis** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 421, 422, pl. 12, fig. 12. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek, Black hills.

— **(Cryptorhytis) kerri** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 283. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: North Carolina.

Fasciolaria—Continued.— **(Cryptorhytis) obliquicostata** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 283, 284. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: North Carolina.

— **(Mesorhytis) gracilenta** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 364, 365, fig. 45, p. 364. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

— **(Piestocheilus) alleni** n. s. White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 34, 35, pl. 12, fig. 1a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Yellowstone river, Mont.

— **(Piestocheilus) cretacea** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 363, 364, pl. 31, figs. 11a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **(Piestocheilus) culbertsoni** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 360-362, pl. 32, fig. 1a-f, and fig. 44, p. 360. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **(Piestocheilus) culbertsoni** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 185. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of Saint Vrain creek, and also in the valley of the Cache à la Poudre, Colo.

— **(Piestocheilus) culbertsoni** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 423, 424, pl. 12, fig. 11. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Near French creek, Black hills.

— **(Piestocheilus)? galpiniana** (M. & H. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 362, 363, pl. 32, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **(Piestocheilus) scarboroughi** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 359, 360, pl. 32, figs. 4a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Butte au Grès, on the Missouri river.

Fasciolaria—Continued.— *sp. undet.* Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 19. Austin, 1889.
R. T. Hill.

Formation: Cretaceous.

Location: North of Webberville, Tex.

Fascipora (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 165. Phila., 1862, 1863. Gabb & Horn

— *americana* n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 165, 166, pl. 21, fig. 54. Phila., 1862,
1863. Gabb & Horn.

Formation: Cretaceous.

Location: Mullica hill and Timber creek, N. J.

Faujasia n. g. d'Orb. (1855.)

Paleont. Francaise, Echinoides Irreguliers, Terr.
Cret., 1 Sixieme, pp. 314, 315. Paris, 1853-1860.
A. D'Orbigny.

— (d'Orb.) Desor. (1858.)

Synop. Echinoides Foss., pp. 316, 317. Paris &
Wiesbade, 1858. E. Desor.

— *florealis* (Mort. sp.) d'Orb. (1855.)

Paleont. Francaise, Echinoides Irreguliers, Terr.
Cret., 1, Sixieme, pp. 319, 320, pl. 920, figs. 5, 6.
Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal.

— *florealis* (Mort. sp.) Desor. (1858.)

Synop. Echinoides Foss., p. 318. Paris & Wiesbade,
1858. E. Desor.

Formation: Cretaceous.

Location: Chesapeake canal, Del.

Faunus (Montfort.) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 20. Wash., 1889.
C. A. White.

— *marcidulus* n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 20, 21, pl. 4,
figs. 12, 13. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Butte county, Cal.

Ficopsis (Con.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 158. Phila.,
1869. W. M. Gabb.

— *cooperii* Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 159. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— *hornii* Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 158. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— *remondii* Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 158. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

Ficus (Klein) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 332. Phila., 1855-1858. T. A. Conrad.

— ? *cypræoides* n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 105, pl. 19,
fig. 58. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Tehama county, Cal.

— *octoliratus* n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 332, pl. 35, fig. 6. Phila., 1855-1858.
T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the
town of Ripley, Miss.

— (*Pyrifusus*) *granosus* n. s. Shumard.
(1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862,
p. 196. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Chatfield point, Navarro county, Tex.

Filifascigera (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 165. Phila., 1862, 1863. Gabb & Horn.

— *megæra* (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 165, pl. 21, figs. 53. Phila., 1862, 1863.

Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, N. J.

Flabellina cordata (Reuss) Credner.
(1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 214. Ber-
lin, 1870. H. Credner.

Formation: Cretaceous.

Location: Brownville, N. J.

Flabellum (Lesson) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 399. Phila., 1858-1860. W. M. Gabb.

— *remondianum* n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 207, pl. 26, fig.
199. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Between Mount Diablo and the coal
mines, Cal.

— *striatum* (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d ser., 1858-
1860, p. 399, pl. 69, figs. 10, 11. Phila., 1858-
1860. W. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluff, Ala.

Flustra (Lam.) Morton. (1829.)

Jour. Acad. Nat. Sci. Phila., vol. 6, 1st ser., 1827-
1831, p. 24. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county,
N. J.

— *sagena* n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 79, pl. 13,
fig. 7. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Flustra—Continued.— *sp. undet.* Morton. (1830.)

Am. Jour. Sci., 1st. ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: Gloucester county, N. J.

Flustrella G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 160. Phila., 1862, 1863. Gabb & Horn.

— *capistrata n. s.* G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 161, pl. 20, fig. 48. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

— *cylindrica n. s.* G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 161 [pl. 20], fig. 49. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

Fragum (Bolton) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 139. Wash., 1885. R. P. Whitfield.

— *tenuistriatum n. s.* Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 139, 140, pl. 20, fig. 15. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schauck's pits, Marlboro, N. J.

Fronicularia? strophoconus Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 29. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Fulgur (Montfort) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 22. Wash., 1889. C. A. White.

— *hilgardi n. s.* White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 22, 23, pl. 3, figs. 2 and 3. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Pence's ranch, Butte county, Cal.

Fulguraria (Schumacker) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 23. Wash., 1889. C. A. White.

— *gabbi n. s.* White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 23-25, pl. 3, fig. 1. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Centerville, Butte county, Cal.

— *gabbi* White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 46, 47. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

Fulguraria—Continued.— *navarroensis* (Shum. sp.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 117-119, pl. 15, figs. 3, 3a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: West side of Hornby island; Blunden point; Browns river, Vancouver island; Sucia islands.

Fulvia (Grey) Whitfield. (1884.)

Mong. U. S. Geol. Sur., vol. 9, p. 139. Wash., 1885. R. P. Whitfield.

— *tenuis n. s.* Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 139, pl. 20, fig. 8. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, Monmouth county, N. J.

Fusus (Klein) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855, 1858, p. 332. Phila., 1855, 1858. T. A. Conrad.

— *sp.* Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 237. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: New Jersey.

— (*Brug. typical.*) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 373. Wash., 1876. F. B. Meek.

— *aratus n. s.* Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 84, pl. 28, fig. 202. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

— *averillii n. s.* Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 83, 84, pl. 18, fig. 34. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Tehama county, Cal.

— *bellaliratus n. s.* Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332, pl. 35, fig. 17. Phila., 1855, 1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— *californicus* (Con.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 85, 86, pl. 28, figs. 205, 205a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Clayton; Cochran's, near Mount Diablo; Alizos creek, near Fort Tejon, Cal.

— *cheyennensis n. s.* Whitfield. (1877.)

U. S. Geogr. and Geol. Sur., Rocky Mountain region: Prelim. Rep. Paleont Black hills, p. 37. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.

Fusus—Continued.

- **cheyennensis** Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 424, 425, pl. 12, fig. 9. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek, Black hills.
- **constrictus** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s. pp. 391, 392, pl. 3, figs. 7a-d. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Sage creek.
- **contortus** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 65. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **culbertsoni** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 66. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **dakotaensis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 65. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **diaboli** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 84, pl. 18, fig. 35. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cochran's, east of Mount Diablo; near Clayton, Cal.
- **flexuocastatus** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 66. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebr.
- **flexuosus** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 85, pl. 21, fig. 109. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez.
- **galpinianus** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 65. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **haydeni** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 41. St. Louis, 1856-1860. Evans & Shumard.
Formation: Cretaceous.
Location: Moreau river.
- **holmesianus** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 389, pl. 68, fig. 4. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Eufaula, Ala.

Fusus—Continued.

- **intertextus** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 139. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, one hundred and fifty miles above its mouth, Nebr.
- **kingii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 85, pl. 28, fig. 204. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, Siskiyou county, north of Yreka, Cal.
- **kingii** (Gabb) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 119, pl. 15, fig. 4. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands.
- **kingii** (Gabb) White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 46. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sheep Jack island.
- **martinez** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 82, 83, pl. 18, fig. 32. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Bulls Head point, northeast of Martinez.
- **mathewsoni** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 83, pl. 18, fig. 33. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez; Clayton; Cochran's, six miles east of Mount Diablo; Curry's, south side of Mount Diablo, Cal.
- **mexicanus** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 259, pl. 35, fig. 2. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **newberryi** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 66. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river and Fox hills, Nebr.
- **nebrascensis** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 41. St. Louis, 1856-1860. Evans & Shumard.
Formation: Cretaceous.
Location: Sage creek, Mauvaises, Tenn.
- **novemliratus** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332, pl. 35, fig. 18. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- **occidentalis** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 126, pl. 26, fig. 23. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.

Fusus—Continued.

- (?) **pedernalis** n. s. Roemer. (1849.)
Texas, pp. 414, 415. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **pedernalis** Roemer. (1852.)
Kreide von Tex., p. 38, Taf. 4, figs. 13a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **retifer** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301, pl. 48, fig. 11. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Mullica hill, N. J.
- **shumardii** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 391, pl. 3, figs. 6a, c. Cambridge & Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **shumardi** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dakota, p. 424, pl. 12, figs., 7, 8. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: East fork of Beaver creek, Black hills.
- **subtunitus** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 139. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Near Grand river, Nebr.
- (?) **tenuilineata** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 392, pl. 3, figs. 8a-c and 9a-c. Cambridge & Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Sage creek.
- **tippana** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 286, pl. 46, fig. 41. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- **trivolvus** n. s. Gabb. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860 p. 94, pl. 2, fig. 5. Phila., 1861. W. M. Gabb.
Formation: Cretaceous.
Location: Timber creek, N. J.
- **tumidus** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 145, 146, pl. 26, fig. 22. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- ? **utahensis** (Meek) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur., Terr., pt. 1, p. 34, pl. 12, fig. 2a. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah, from "Chalk hill."

Fusus—Continued.

- **vaughani** n. s. (M. & H.) (1875.)
Proc. Acad. Nat. Sci., Phila., for 1857, pp. 138, 139. Phila., 1858. Meek & Hayden.
Formation: Junction of upper Cretaceous and Tertiary beds. [Cretaceous.]
Location: Near mouth of Heart river, Nebr.
- (**Exilifusus**) **kerri** n. s. Gabb. 1876.
Proc. Acad. Nat. Sci. Phila., for 1876, p. 279, pl. 17, fig. 1. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: North Carolina.
- (**Hemifusus**) **cooperii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. pp. 86, 87, pl. 28, fig. 207. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: San Diego, and Cochran's, east of Mount Diablo, Cal.
- (**Hemifusus**) **hornii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 86, pl. 28, figs. 206, 206a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.
- (**Hemifusus**) **remondii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 87, pl. 18, fig. 36. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cochran's, east of Mount Diablo; Bulls head point, northeast of Martinez; Alizos creek, near Fort Tejon, Cal.
- (**Neptunea**?) **gabbi** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 504, 505. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Neptunea**?) **gabbi** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Neptunea**?) **gabbi** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 317, pl. 9, fig. 9a. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Neptunea**?) **utahensis** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 505. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah; from "Chalk hill."

Fusus—Continued.— (**Neptunea**) **utahensis** (Meek)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

— (**Pleurotoma** ?) **scarboroughi** n. s.
(M. & H.) (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 139,
140. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Butte aux Grès, on the Missouri river,
Nebr.

— (**Serrifusus**) **dakotensis** (M. & H.)
Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 374, 375,
pl. 31, fig. 11 and pl. 32, figs. 6a, b. Wash.,
1876. F. B. Meek.
Formation: Cretaceous.
Location: Long lake and Moreau river, Dak.

— ? (**Serrifusus**) **dakotensis** n. var.
Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 375–377, pl.
32, fig. 7a (and 7, b?) Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak.

— **sp. undet.** Owen. (1860.)

Second Rep. Geol. Rec. Arkansas, pl. 8, fig. 4.
Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.

Gadus (Rang.) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p.
101, Phila., 1870. T. A. Conrad.

— **obrutus** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 101,
pl. 9, fig. 18. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.

Galaxias (subgen. Beck.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 549. Wash.,
1876. F. B. Meek.

Galerites (**Descoidea**) **sp. nov.** Hill.
(1889.)

Geol. Sur. Tex. Bull. No. 4, p. 2. Austin 1889.
R. T. Hill.
Formation: Cretaceous.
Location: Sierra Blanca district, Tex.

Galerus (Humph.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 136. Phila.,
1864. W. M. Gabb.

— **excentricus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 136, pl. 20, fig.
95; pl. 29, fig. 232a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Northeast of Martinez; Clayton; seven
miles south of Martinez; San Diego; near Fort
Tejon, Cal.

Gari (Shum.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 155. Phila.,
1864. W. M. Gabb.

— **elliptica** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 307,
308. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Ga.

— ? **texta** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 155 pl. 22,
fig. 130. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez, Cal.

Gastrochæna (Spengl.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858–
1860, p. 393. Phila., 1858–1860. W. M. Gabb.

— **americana** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d. ser., 1858–
1860, p. 393, pl. 68, fig. 20. Phila., 1858–1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Timber creek and Burlington county,
N. J.

— **americana** (Gabb) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 203, 204, pl. 26,
figs. 17, 18. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Timber creek, N. J.

— **tibialis** (Mort. sp.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 236,
237. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.

Gemma ? (Deshayes) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 96.
Phila., 1870. T. A. Conrad.

— **cretacea** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp.
96, 97, pl. 9, fig. 19. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county?, Miss.

Genota (subgen. H. & A. Ad.) Meek.
(1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 382. Wash.,
1876. F. B. Meek.

Gervillia (Defrance) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d. ser., 1855–
1858, p. 328. Phila., 1855–1858. T. A. Conrad.

— **ensiformis** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci. Phila., vol. 3, 2d. ser., 1855–
1858, pp. 328, 329, pl. 34, fig. 10. Phila., 1855–
1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.

— **gregaria** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856–1860, pp.
606, 607. St. Louis, 1856–1860. B. F. Shumard.
Formation: Cretaceous.
Location: Bluffs of Red river, Lamar county,
Tex.

Gervillia—Continued.

- **gregaria** (Shumard) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 38, pl. 18, fig. 3a. Wash., 1883.
C. A. White.

- **montanaensis** (Meek) White.
(1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 145, pl. 37, fig. 1, b, a. Wash.,
1883. C. A. White.

Formation: Jurassic.

Location: Near the lower canyon of Yellowstone
river, Mont.

- **mudgeana n. s.** White. (1879.)

Proc. U. S. Nat. Mus., vol. 2, pt. 2, pp. 295, 296,
pl. 5, figs. 3 and 4, Wash., 1880. Smithsonian.
Misc. Coll., vol. 19. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Saline county, Kans.

- **mudgeana** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 16, 17, pl. 14, figs. 3a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Saline county, Kans.

- **recta n. s.** (M. & H.) (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 441.
Phila., 1862. Meek & Hayden.

Formation: Cretaceous.

Location: Deer creek, near north branch Platte
river, Nebr.

- **recta** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 66, 67, pl.
29, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Deer creek, near North Platte.

- **recta** (Meek) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 358, 359,
pl. 4, fig. 3. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Near Sun Dance hills, Black hills.

- **recta** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 35. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Bulls Head, about twenty-two miles
west of the west end of the Cypress hills,
Canada.

- **recta var. borealis n. var.** Whit-
eaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 35, 36, pl. 4, figs. 2, 2a, b.
Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, west of the mouth of the
St. Mary river; Belly river, near the mouth of
the St. Mary river; St. Mary river, near the
Police Fort; South Saskatchewan, opposite
Swift Current creek; Lone crossing of the
Red Deer river, township 35, range 16, west of
fourth principal meridian; Berry creek, section
31, township 25, range 12, west of fourth prin-
cipal meridian, Canada.

Gervillia—Continued.

- **recta var. borealis** Whiteaves.
(1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 2, p. 175. Montreal, 1889. J.
F. Whiteaves.

Formation: Cretaceous.

Location: Sounding creek, township 30, range 8,
west of the fourth principal meridian, Northwest
Territory.

- **solenoides** (Defr.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 232, 233.
Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Woodbury, N. J.

- **sparsalirata n. s.** Whitfield. (1876.)

Rep. Rec. Carroll, Mont., to Yellowstone and Na-
tional park, p. 142, pl. 2, fig. 8. Wash., 1876.
R. P. Whitfield.

Formation: Jurassic.

Location: Bridges mountains, Mont.

- **subtortuosa n. s.** M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 276.
Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Three hundred miles above Fort Union,
on the Missouri, Nebr.

- **subtortuosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 65, 66, pl. 16,
figs. 7a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Three hundred miles above Fort Union,
on the Missouri river.

- Gervilliopsis n. g.** Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 73. Wash., 1885.
R. P. Whitfield.

- **ensifomis** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 73, 74, pl. 15,
figs. 8-11; pl. 16, fig. 5. Wash., 1885. R. P.
Whitfield.

Formation: Cretaceous.

Location: Woodbury, Gloucester county, N. J.

- **minima n. s.** Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 74, 75, pl. 15,
fig. 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold, N. J.

- Globiconcha** (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 319
Phila., 1862. W. M. Gabb.

- **coniformis n. s.** Roemer. (1849.)

Tex., p. 411. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Upper course of Pedernales river,
Tex.

- **coniformis** Roemer. (1852.)

Kreide von Tex., p. 42, Taf. 4, figs. 5, a, b.
Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: On the upper course of Pedernales
river, Tex.

Globiconcha—Continued.

- **curta** n. s. Gabb. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 319.
 Phila., 1862. W. M. Gabb.
 Formation: Cretaceous.
 Location: Comanche peak, Tex.
- (?) **elevata** n. s. Shumard. (1853.)
 Expl. Red river, Louisiana, by R. B. Marcy, p. 208, pl. 4, fig. 4. Wash., 1853. B. F. Shumard.
 Formation: Cretaceous.
 Location: Cross Timbers, Tex.
- **planata** n. s. Roemer. (1849.)
 Tex., p. 411. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Waco camp, above New Braunfels, Tex.
- **planata** Roemer. (1852.)
 Kreide von Tex., pp. 42, 43, Taf. 4, figs. 6, a, b.
 Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Waco camp, on the Guadalupe, sixteen miles above New Braunfels, Tex.
- (**Phasianella** ?) **remondii** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 114, pl. 19, fig. 69. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Two miles north of Benicia, Cal.
- (**Tylostoma**) **tumida** n. s. Shumard. (1853.)
 Expl. Red River, La., by R. B. Marcy, p. 208, pl. 5, fig. 3. Wash., 1853. B. F. Shumard.
 Formation: Cretaceous.
 Location: Cross Timbers, Tex.
- ? n. s. Hill. (1889.)
 Geol. Sur. Tex., Bull. No. 4, p. 20. Austin, 1889.
 R. T. Hill.
 Formation: Cretaceous.
 Location: [Shoal Creek], Tex.
- Glycimeris** (Lam.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 248, 249.
 Wash., 1876. F. B. Meek.
- **berthoudi** n. s. White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Fossil ridge, Colo.
- **berthoudi** White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 299, 300, pl. 6, figs. 1a, b. Wash., 1879.
 C. A. White.
 Formation: Cretaceous.
 Location: About fifteen miles west of Greeley and about six miles south of Fort Collins, Colo.
- ? **dalli** n. s. White. (1889.)
 Bull. U. S. Geol. Sur., No. 51, pp. 66, 67, pl. 14, figs. 7-9. Wash., 1889. C. A. White.
 Formation: Jurassic.
 Location: Kialagvic bay, Alaska.

Glycimeris—Continued.

- **occidentalis** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 250, pl. 30, figs. 9, a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Mouth of Judith river, on the Missouri.
- Gnathodon** (—) Whitfield. (1885.)
 Mong. U. S. Geol. Sur., vol. 9, p. 27. Wash., 1885. R. P. Whitfield.
- ? **tenuidens** n. s. Whitfield. (1885.)
 Mong. U. S. Geol. Sur., vol. 9, pp. 27, 28, pl. 2, figs. 7-10. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Sayre's and Fisher's brickyards, and at R. N. and H. Valentine's, near Woodbridge, N. J.
- Goniaster mammillata** n. s. Gabb. (1876.)
 Proc. Acad. Nat. Sci. Phila., for 1876, pp. 178, 179, pl. 5, figs. 2, 2a, b. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Neighborhood of Vincenttown, N. J.
- Goniatites** (De Haan) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 21. Phila., 1864. W. M. Gabb.
- **laevadorsatus** (Hauer sp.) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, pp. 21, 22, pl. 3, figs. 6, 7. Phila., 1864. W. M. Gabb.
 Formation: Triassic.
 Location: Opposite the military station in Owen's valley, Tulare county, Cal., about thirteen miles north of Owen's lake.
- Goniobasis** (Lea) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 560, 561. Wash., 1876. F. B. Meek.
- **arcta** (Meek) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Near Mellis station, Wyo.
- **chrysallis** n. s. Meek. (1871.)
 Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 316. Wash., 1871. F. B. Meek.
 Formation: Tertiary [Cretaceous].
 Location: Bear river, near Sulphur creek, Utah.
- **chrysallis** (Meek) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 245. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Bear river valley, Wyo.
- **chrysallis** (Meek) White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 91, 92, pl. 30, figs. 6a, b. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Near the mouth of Sulphur creek, Bear river valley, Wyo.

Goniobasis—Continued.

- **chrysallis** (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 56, pl. 6, figs. 13, 14. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent parts of Utah.
- **chrysalloidea n. s.** White. (1876.)
Rep. Geol. Uinta Mts., 123. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, near Mellis station, Wyo.
- **chrysalloidea** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 245. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.
- **chrysalloidea** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 92, pl. 30, figs. 6a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Sulphur creek, Bear river valley, Wyo.
- **chrysalloidea** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 92, pl. 30, figs. 6a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Sulphur creek, Bear river valley, Wyo.
- **chrysalloidea** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 56, pl. 6, figs. 10, 11. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent parts of Utah.
- **cleburni n. s.** White. (1876.)
Rep. Geol. Uinta Mts., pp. 122, 123. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, near Mellis station, Wyo.
- **cleburni** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 244, 245. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.
- **cleburni** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 91, pl. 30, figs. 4a-d. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Sulphur creek, Bear river valley, Wyo.
- **cleburni** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 56, pl. 6, figs. 7-9. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent parts of Utah.

Goniobasis—Continued.

- **convexa** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 562, 563, pl. 42, figs. 2a, b, fig. 71, p. 562, fig. 72, p. 563. Wash., 1876. F. B. Meek.
Formation: Probably Cretaceous.
Location: At the mouth of Judith river, Mont.
- **convexa** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Judith river, Mont.
- **convexa** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26, figs. 6, 7. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **convexa var. impressa** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 563, 564, pl. 42, figs. 2c, d. Wash., 1876. F. B. Meek.
Formation: Probably Cretaceous.
Location: Mouth of Judith river, Mont.
- **convexa var. impressa** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26, figs. 8, 9. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: [Upper Missouri river region?]
- **endlichi n. s.** White. (1878.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 716. Wash., 1878. C. A. White.
Formation: Cretaceous.
Location: Seven miles west of Evanston, Wyo.
- **endlichi** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 245. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Seven miles northward from Evanston, Wyo.
- **endlichi** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 92, 93, pl. 30, figs. 7a-c. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Seven miles northward from Evanston, on the Bear river valley [Wyoming].
- **endlichi** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 7, figs. 7-9. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent parts of Utah.
- **gracilenta n. s.** Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 568, 569, pl. 42, fig. 3, fig. 74, p. 569. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.

Goniobasis—Continued.

- **gracilenta** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 220. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black buttes station, Wyo.
- **gracilenta** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 171. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Crow creek valley, Colo.
- **gracilenta** (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26,
figs. 12, 13. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Crow creek valley, northern Colorado,
east of the Rocky mountains; Black buttes,
Wyo.
- **gracilenta** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **? insculpta** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 515, 516. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Rock springs, Wyo.
- **invenusta** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 564, 565,
pl. 42, figs. 1a-e. Wash., 1876. F. B. Meek.
Formation: Probably Cretaceous.
Location: Mouth of Judith river, Mont.
- **invenusta** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Judith river, Mont.
- **invenusta** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 17,
fig. 17. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **? omitta** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 568, pl. 42,
figs. 4a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **? omitta** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Judith river, Mont.
- **? omitta** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26,
fig. 10. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.

Goniobasis—Continued.

- **macilenta** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 93, pl. 30, fig. 10a. Wash., 1883.
C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Sulphur creek, val-
ley of Bear river, Wyo.
- **macilenta** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 56, pl. 6, fig.
12. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent
parts of Utah.
- **nebrascensis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 565, 566,
pl. 43, figs. 12a-h, fig. 73, p. 565. Wash., 1876.
F. B. Meek.
Formation: Cretaceous.
Location: Fort Clarke, and at mouth of Yellow-
stone river.
- **nebrascensis** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 171. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Crow creek valley, Colo.
- **nebrascensis** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **nebrascensis** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26,
figs. 15, 16. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Wales, Utah.
- **nebrascensis** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 21, 22, pl. 3, figs. 4, 4a.
Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: North or second branch of the Milk
river; Old Man river, two miles above Rye-
Grass flat, and St. Mary river, three miles
north of the forty-ninth parallel, Canada.
- **sublævis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 567, pl. 42;
figs. 5a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **sublævis** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 94. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near the mouth of Judith river, Mont.

Goniobasis—Continued.— **sublævis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26, fig. 18. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— ? **subtortuosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 569, 570, pl. 42, figs. 17a, b, figs. 75, 76, p. 569. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river.

— ? **subtortuosa** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 27, fig. 34. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— ? **subtortuosa** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 94. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near the mouth of Judith river, Mont.

— **subtortuosa** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 74, 75, pl. 10, fig. 7. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, two miles above Woodpecker island, and Belly river, east side of Driftwood bend; South Saskatchewan, one mile above the mouth of the Bow river, Canada.

— **tenuicarinata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 566, 567, pl. 43, figs. 14a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near Fort Union, Mont.

— **tenuicarinata** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 94. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **tenuicarinata** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 57, pl. 26, fig. 11. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Wales, Utah; Cross creek valley; Northern Colorado, east of the Rocky mountains.

— **tenuicarinata** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 22, pl. 3, figs. 5, 5a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bow river, two miles below the mouth of Jumping Pound river, Canada.

Goniobasis—Continued.— **tenuicarinata** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 27. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Pyramid creek, Canada.

— **tenuicarinata** (M. & H.) var. **Whiteaves**. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 22, 23, pl. 3, figs. 6, 6a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Two miles above Rye-Grass flat and twelve miles below Fort MacLeod on the Old Man river; Gooseberry canyon on the St. Mary river; Pincher creek, Canada.

Goniochasma n. g. Meek. (1864.)

Check List Invert. Foss. N. Am., Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 34. Wash., 1864. F. B. Meek.

Type: *Xylophaga stimpsoni* (M. & H.) Meek.

— **subgen.** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 255. Wash., 1876. F. B. Meek.

— **stimpsoni** (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 34. Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Dakota.

Goniomya (Agas.) Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 11, Phila., 1870. W. M. Gabb.

— **americana n. s.** M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 81, 82, Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Monroe trading post, Nebr.

— **americana** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 221, 222, pl. 30, figs. 12a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Dak.

— **aperta n. s.** Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 11, pl. 6, fig. 8, Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Volcano about thirty miles southeast of Walkers lake, Nev.

— **borealis** Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, pp. 362, 363, pl. 2, fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **montanaensis** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 151, pl. 38, fig. 8a. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Near the lower canyon of the Yellowstone river, Mont.

Goniomya—Continued.— **Whiteaves.** (1882.)

Proc. and Trans. Roy. Soc. Can., vol. 1, sec. 4, p. 83. Montreal, 1883. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northeast slope of Jackass mountain, in the valley of the Lower Fraser, Canada.

— **sp. undet. Whiteaves.** (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 225. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Alliford bay.

Goniosoma n. g. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 43, 44. Phila., 1870. T. A. Conrad.

— **inflata** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 44, pl. 1, fig. 10. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Crosswicks, N. J.

Gouldia [Adams] Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 48. Phila., 1870. T. A. Conrad.

— **conradi** n. s. Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 125, 126, pl. 18, figs. 1-3. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— **declivis** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pl. 9, fig. 5. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— **declivis** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 126, pl. 18, fig. 11. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— **decemnaria** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 48, pl. 9, fig. 4. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— **decemnaria** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 124, 125, pl. 18, fig. 4. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— **parilis** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 126, 127, pl. 18, figs. 12, 13. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Marlboro, N. J.

Grammatodon n. g. M. & H. (1865.)

Paleont. Up. Mo., Smithson. Cont. Knowl., vol. 14, No. 172, pp. 89, 90. Wash., 1865. Meek & Hayden.
Type: *Arca* (cucullata) *inornata* M. & H.

Grammatodon—Continued.— (?) **iltasyoucoensis** n. s. Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 404. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

— (?) **iltasyoucoensis** Whiteaves. (1878.)

Geol. Sur. Can.; Rep. Prog. for 1876, 1877, pp. 153, 154. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.

— **inornatus** M. & H. (1865.)

Paleont. Up. Mo., Smithson. Cont. Knowl., vol. 14, No. 172, p. 90, pl. 3, figs. 9, 9a, b. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills.

— **inornatus** (M. & H.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 404. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

— **inornatus** (M. & H.) Whiteaves. (1878.)

Geol. Sur. Can.; Rep. Prog. for 1876, 1877, p. 153. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.

— **inornatus** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 359, 360, pl. 5, figs. 16-18. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Near the Black hills.

— **inornatus** (M. & H.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, p. 235, pl. 31, figs. 8, 8a, b. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: North shore of Cumshewa inlet, Skidegate inlet, south side of Alliford bay, bay east of Alliford bay.

— ? **vancouverensis** Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 356, 357, pl. 3, figs. 5, 5a. Wash. 1876. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, Vancouver island.

— ? **vancouverensis** (Meek) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 39. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia island.

Grammostomum americanum Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 11. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.

— **americanum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 15. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **invalidum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 17. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **phyllodes** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 16. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **rhomboidale** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 19. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **tessera** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 18. Leipzig, 1856.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **validum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 12. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.

Granoarca (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 78, 79.
Wash., 1876. F. B. Meek.

Granocardium n. subgen Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 266. Phila., 1869. W. M. Gabb.

Graptocarcinus texanus n. s. Roemer. (1887.)

Neues Jahrbuch f. Mineral. Geol. u. Paleont., pp. 173-176, figs. a and b, text. Stuttgart, 1887.
F. Roemer.
Formation: Cretaceous.
Location: Shoal creek, near Austin, Tex.

Gryphæa [Lam.] Morton. (1828.)

Jour. Acad. Nat. Sci. Phila., vol. 6, 1st ser. 1827-1831, p. 79. Phila., 1827-1831. S. G. Morton.

— **aucella** n. s. Roemer. (1849.)

Texas, p. 395. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Ford near New Braunfels, Tex.

— **bryani** (Gabb) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 206, 207, pl. 27, figs. 6-9. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Vincenttown, N. J.

Gryphæa—Continued.— **bryani** var. **precedens** n. var. Whitfield. (1885.)

Mong. U. S. Geol. Sur. vol. 9, pp. 194, 195, pl. 26, figs. 7, 8. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.

Location: Throughout Monmouth county and also particularly so in the vicinity of New Egypt, N. J.

— **calceola** (Quenstedt?) Meek. (1860.)

Rep. Expl. Great Basin Terr., Utah, p. 356, pl. 3, fig. 2. Wash., 1876. F. B. Meek.
Formation: Jurassic.
Location: Near the Red buttes, on the North Platte.

— **calceola** var. **nebrascensis** n. var. M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 437-439, Phila., 1862. Meek & Hayden.
Formation: Jurassic.
Location: Head of Wind river valley, at base of mountains, Nebr.

— **calceola** var. **nebrascensis** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14. No. 172, pp. 74-76, pl. 3, figs. 1 a-e, and annexed cuts. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Wind river mountains, southern part of Dakota: Red buttes, further east, Dakota.

— **calceola** var. **nebrascensis** (M. & H.) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 286, 287, pl. 7, fig. 11. Wash., 1877. Hall & Whitfield.
Formation: Jurassic.
Location: Sheep creek, Uinta range, Utah; and on Ashley creek, Uinta range.

— **calceola** var. **nebrascensis** (M. & H.) Whiteaves. (1878.)

Canadian Naturalist vol. 8, n. ser., No. 7, p. 401. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

— **calceola** var. **nebrascensis** (M. & H.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-77, p. 151. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.

— **calceola** var. **nebrascensis** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 349, 350, pl. 3, figs. 13-16. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Wind river mountains.

— **calceola** var. **nebrascensis** (M. & H.) White. (1885.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 290, pl. 35, figs. 1-5. Wash., 1884. C. A. White.
Formation: Jurassic.
Location: Distant localities in Wyoming and Idaho.

Gryphæa—Continued.

- **convexa** n. s. Morton. (1828.)
 Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1828-1831, pp. 79, 80, pl. 4, figs. 1, 2. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
 Location: Woodward's farm, near Wainford, New Egypt, N. J.; St. Georges, Del.
- **convexa** (Say sp.) Morton. (1829.)
 Jan. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 121. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
 Location: Big Timber creek, Gloucester county, N. J.
- **convexa** (Say sp.) Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 283. New Haven, 1830. S. G. Morton.
 Formation: [Cretaceous.]
 Location: New Jersey.
- **convexa** (Say) Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 53, pl. 4, figs. 1, 2. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey, Delaware, and Alabama.
- **convexa** (Say) Troost. (1840.)
 Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G. Troost.
 Formation: Cretaceous.
 Location: McNairy county, Tenn.
- **corrugata** n. s. Say. (1823.)
 Account of Exped. Pittsburg to Rocky mountains, vol. 2, pp. 410, 411. Phila., 1823. Thos. Say.
 Formation: [Cretaceous.]
 Location: About Red river.
- **dilatata** var. **tucumcarii** n. var. Marcou. (1858.)
 Geol. N. Am. pp. 43, 44, pl. 4, figs. 1, 1a, b, 2, 3. Zurich, 1858. Jules Marcou.
 Formation: Jurassic [Cretaceous].
 Location: Bluffs surrounding Plaza Larga, in the bed of Fossil creek, at the big and little Tucumcarii, Pyramid mount, Monte revnelto and the Llano Estacado, near the village of Covero, New Mexico, and on the tableland or mesa between Inscription rock and the Canoncito Bonito, west of the Sierra Madre. Southern part of the Llano Estacado. Leon springs between Fort Inge, Tex., and El Paso, Chihuahua.
- **mucronata** Gabb. (1869.)
 Geol. Sur. Cal., Paleont., vol. 2, pp. 274, 275. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **mucronata** (Gabb) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 302. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **mutabilis** n. s. Morton. (1828.)
 Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1828-1831, pp. 81-83, pl. 4, fig. 3. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey and Delaware.

Gryphæa—Continued.

- **mutabilis** (Say sp.) Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 283. New Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey.
- **mutabilis** Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., pp. 53, 54, pl. 4, fig. 3. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey, Delaware, Alabama, Tennessee, and Missouri.
- **mutabilis** (Mort.) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 302. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **navia** (Con.) Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, pp. 273, 274. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **navia** (Con.) White. (1883.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 302. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **nebrascensis** (M. & H.) Whiteaves. (1884.)
 Geol. and Nat. Hist. Sur. Can. Mess. Foss., vol. 1, pt. 3, pp. 244, 245, pl. 32, figs. 2, 2a, b. Montreal, 1884. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: East end of Maud island; south side of Alliford bay.
- **pitcheri** n. s. Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 55, pl. 15, fig. 9. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Plains of the Kiamesha, in Arkansas; falls of Verdigris river, in the same territory.
- **pitcheri** (Morton) Roemer. (1849.)
 Tex., pp. 394, 395. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Eight miles above New Braunfels, Mission hill, upper Brazos river, and near Fredericksburg, Tex.
- **pitcheri** Morton. (1852.)
 Kreide von Tex., pp. 73, 74, Taf. 9, figs. 1a-c. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Guadalupe river, eight miles above New Braunfels, Mission hills, upper Brazos river, and Fredericksburg, Tex.
- **pitcheri** (Mort.) Shumard. (1853.)
 Expl. Red river, Louisiana, by R. B. Marcy, p. 205, pl. 6, fig. 5. Wash., 1853. B. F. Shumard.
 Formation: Cretaceous.
 Location: Fort Washita, Ind. T.; Cross Timbers, Tex.
- **pitcheri** (Mort.) Blake. (1855.)
 Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 2; Rep. Geol. Thirty-second Parallel, p. 39. Wash., 1855. W. P. Blake.
 Formation: Cretaceous.
 Location: From the Big springs of the Colorado.

Gryphæa—Continued.

- **pitcheri** (Morton) Conrad. (1855.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 155, pl. 7, fig. 3; pl. 10, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Leon springs, Tex., plains of the Kiamasha, Ark., New Braunfels, Tex., Fort Washita and Cross Timbers, Tex.
- **pitcheri** (Mort.) Schiel. (1855.)
Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 2; Rep. Expl. Forty-first parallel, N. Lat., p. 108, pl. 3, fig. 9. Wash., 1855. James Schiel.
Formation: Cretaceous.
Location: Top of a sand hill near Grand river.
- **pitcheri** (Mort.) Hall. (1856.)
Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 3, pt. 4, pp. 99, 100, pl. 1, figs. 1-6. Wash., 1856. James Hall.
Formation: Cretaceous.
Location: Pyramid mountain, Plaza Larga, Camp 50.
- **pitcheri** (Morton) Marcou. (1858.)
Geol. N. Am. pp. 38-40, pl. 4, figs. 5, 5a, b, 6. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Hills surrounding Comet creek, one of the affluents of the False Washita river (Long. 99°, Lat. 35° 50'); on the bank of the Canadian; at Fort Washita; in the plain of Kiamasha, Arkansas; at the fall of the Verdigris river, affluent of the Arkansas; near Preston; in the vicinity of New Braunfels; and at Waco camp on the Rio Guadalupe, Tex.
- **pitcheri** (Mort.) Gabb. (1860.)
Second Rep. Geol. Rec. Arkansas, pl. 7, fig. 6. Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.
- **pitcheri** (Mort.) Newberry. (1861.)
Rep. Colorado river of the West, pt. 3, p. 121. Wash., 1861. J. S. Newberry.
Formation: Cretaceous.
Location: A few miles east of Fort Defiance, still further eastward near Covera; on the banks of the Pecos, east of Albuquerque.
- **pitcheri** (Morton) Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 272, 273. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **pitcheri** (Mort.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 302, 303, pl. 49, figs. 1-6. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **pitcheri** var. **navia** n. var. Hall. (1856.)
Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 3, pt. 4, p. 100, pl. 1, figs. 7-10. Wash., 1856. James Hall.
Formation: Cretaceous.
Location: False Washita, Camp 31.

Gryphæa—Continued.

- **pitcheri** var. **navia** (Hall) Newberry. (1861.)
Rep. Colorado river of the West, pt. 3, p. 120. Wash., 1861. J. S. Newberry.
Formation: Cretaceous.
Location: At the Moqui villages; east of Fort Defiance; on the Pecos.
- **pitcheri** var. **navia** (Hall) Whitfield. (1884.)
Mong. U. S. Sur., vol. 9, p. 38. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Moumouth county and Blue Ball, N. J.; also from Freehold, Burlington, Timber creek, and New Egypt, N. J.
- **pitcheri** var. (Mort.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 171, 172, pl. 17, figs. 1a-f. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Twenty-five miles southwest of and also near Paria; east fork of Paria creek; east of Impracticable ridge; Dirty Devil river, east of ridge, Utah; canyon five miles west of Puerco; east of Mount Taylor, and Acoma plateau, New Mexico, etc.
- **planoconvexa** n. s. Whitfield. (1876.)
Rep. Rec. Carroll, Mont., to Yellowstone National Park, p. 142, pl. 2, figs. 9, 10. Wash., 1876. R. P. Whitfield.
Formation: Jurassic.
Location: In the Bridger mountains, Mont.
- **plicatella** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 9, fig. 4, [vol. 24]. New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: Alabama.
- **plicatella** Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 4. New Haven, 1833. S. G. Morton.
- **sinuata** var. **americana** n. var. Marcou. (1858.)
Geol. N. Am., pp. 37, 38, pl. 3, fig. 1. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Borders of Red river, near Preston, Tex.
- **thirsæ** n. s.* Gabb. (1861.)
Proc. Acad. Nat. Sci. Phila., for 1861, pp. 329, 330. Phila., 1862. W. M. Gabb.
Formation: Cretaceous. [Tertiary.]
Location: "Nanafalia," Ala.
- **thirsæ** (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 303. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **vesicularis** (Lam.) Bronn. (1838.)
Lethæa Geognostica, Zweiter Band, pp. 670-672. Taf. 32, figs. 1 a-e. Stuttgart, 1838. H. G. Bronn.
Formation: Cretaceous.
Location: New Jersey.

*Nanafalia Bluff referred to Tertiary by Smith & Johnson. G. thirsæ, referred to Ostred thirsæ by Heilprin.

Gryphæa—Continued.

- **vesicularis** (Lam.) Gabb. 1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 205. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near San Diego, Cal.
- **vesicularis** (Lam.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 20, 21, pl. 11, figs. 2a-c; pl. 16, figs. 8a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Cheyenne river, near the Black hills.
- **vesicularis** (Lam.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 323. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Georgetown, Ga.
- **vesicularis** (Lam.) White. (1883.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 303, pl. 48, figs. 1-5. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **vesicularis** (Lam.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 194, pl. 26, figs. 9, 10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: New Jersey.
- **vesicularis** (Lam.?) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 36-39, pl. 3, figs. 15, 16; pl. 4, figs. 1-3; pl. 5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: All the noted localities of the lower and middle green sands of the New Jersey Cretaceous.
- **vesicularis** var. **aucella** (Roem.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 37, 38, pl. 26, figs. 9, 10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: New Jersey.
- **vesicularis** var. **convexa** (Say) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 37. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Monmouth, Cream ridge, New Egypt, Harrisonville, near Mullica hill, and elsewhere in New Jersey.
- **vesicularis** var. **mutabilis** (Mort.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 38, pl. 4, fig. 3. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Monmouth county, N. J., Cream ridge, N. J.
- **vesicularis** var. **No. 4. n. var.** Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 38, pl. 3, fig. 15. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: New Jersey.

Gryphæa—Continued.

- **vomer n. s.** Morton. (1828.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 83-85, pl. 5, figs. 1-3. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Near New Egypt, N. J.
- **vomer** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, pl. 3, figs. 1, 2. New Haven, 1830. S. G. Morton.
- **vomer** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 283. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **vomer** Morton. (1830.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser. 1827-1831, pp. 197, 198, pl. 8, figs. 11, 12. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: New Egypt, N. J.
- **vomer** Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 5. New Haven, 1833. S. G. Morton.
- **vomer** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 54, 55, pl. 9, fig. 5. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Egypt, N. J.
- **vomer** (Mort.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 303. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **washitaensis n. s.** Hill. (1889.)
Geol. Sur. Tex., Bull. No. 4, p. 4. Austin, 1889. R. T. Hill.
Formation: Cretaceous.
Location: Washita limestone, extending southward continuously through Denison, Fort Worth, and Austin, Tex.
- (— ?) Blake. (1855.)
Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 2; Rep. Geol. Thirty-second parallel, p. 40. Wash., 1855. W. P. Blake.
Formation: Cretaceous.
Location: Elm fork of the Trinity river.
- — Meek. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 42, pl. 8, figs. 4, 4a. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genessee valley, Plumas county, Cal.
- — ? White. (1878.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- ? — Whiteaves. (1882.)
Proc. and Trans. Roy. Soc. Can., vol. 1, sec. 4, p. 85. Montreal, 1883. J. F. Whiteaves.
Formation: Cretaceous.
Location: Skagit river, Canada.

Gryphæa—Continued.— **sp. undet. Urquiza.** (1882)

An. Min. Fomento Rep. Mex., Tomo 7, p. 224,
fig. 16. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Astala, Coalcoman district, state of
Michoacan, Mex.

Gryphæostrea (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 11. Wash.,
1876. F. B. Meek.

— (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 195. Wash.,
1885. R. P. Whitfield.

— **vomer** (Mont.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 195, 196, pl.
26, figs. 11, 12. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.

Location: Timber creek, near New Egypt, Mul-
lica hill, Monmouth county, N. J.

Gryphorhynchus n. g. Meek. (1864.)

Am. Jour. Sci., 2d ser., vol. 37, pp. 217, 218. New
Haven, 1864. F. B. Meek.

Guttulina turrita Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 28. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Gymnarus n. subgen. Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 139. Phila., 1868.
W. M. Gabb.

Gymnotoceras n. g. Hyatt. (1877.)

Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1,
pp. 110, 111. Wash., 1877. Alpheus Hyatt.

— **blakei** (Gabb sp.) Meek. (1877.)

Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1,
pp. 113-116, pl. 10, figs. 10, 10a-c, pl. 11, figs.
6, 6a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Cottonwood canyon, West Humboldt
range, Nev.

— **rotelliforme n. s.** Meek. (1877.)

Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1,
pp. 111-113, pl. 10, figs. 9, 9a. Wash., 1877.
F. B. Meek.

Formation: Triassic.

Location: Buena Vista canyon, West Humboldt,
range, Nev.

Gyraulus (subgen. ag.) Meek. (1876.)

Rep. U. S. Geol. Sur., Terr., vol. 9, p. 536.
Wash., 1876. F. B. Meek.

Gyrodes (Con.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 320.
Phila., 1862. W. M. Gabb.

— **abbotti n. s.** Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 320-321.
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Mullica hill, N. J.

Gyrodes—Continued.— **abyssinus** (Morton sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 295.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— **conradi n. s.** Meek. (1876.)

Rep. U. S. Geol. Ser. Terr., vol. 9, pp. 310, 311,
figs. 33-36, p. 310. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne river, Dak.

— **conradiana** (Gabb) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 45. Wash.,
1889. C. A. White.

Formation: Cretaceous, Vancouver group.

Location: Sucia and Sheep Jack islands.

— **depressa n. s.** Meek. (1877.)

Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1,
pp. 159, 160, pl. 15, figs. 1, 1a. Wash., 1877.
F. B. Meek.

Formation: Cretaceous.

Location: Chalk creek, at the mouth of the
canyon above Coalville, Utah.

— **depressa** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **dowelli n. s.** White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 19, pl. 3, figs.
8 and 9. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Jacksonville, Oreg.

— **expansa n. s.** Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 108, pl. 19,
figs. 62a-c. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Hills southwest of Martinez; Pence's
ranch, above Oroville, Butte county; north
fork of Cottonwood creek; Tuscan springs;
Texas flat, Placer county; Siskiyou mountains,
Siskiyou county, Cal.; Jacksonville, Oreg.

— **expansa?** (Gabb) Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 263.
Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Protection island.

— **excavata** (Michelin sp.) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 124,
125, pl. 16, figs. 2, 2a. Montreal, 1879. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island;
Brown river, Vancouver island; Nanaimo
river, ten miles up, Vancouver island; Blunden
point, Vancouver island; Sucia islands.

Gyrodes ? obtusivolva n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 320.
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

Gyrodes—Continued.

- **petrosa** (Morton sp.) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 295.
 Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Glassboro and Mullica hill, N. J.

- **spillmanii** n. g. Gabb. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 320.
 Phila., 1862. W. M. Gabb.
 Formation: Cretaceous.
 Location: Mississippi.

- Gyrotropis** n. g. Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 300.
 Phila., 1876. W. M. Gabb.

- **squamosus** n. s. Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, pp. 301,
 301. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Snow hill, N. C.

- Hyatt, A.** (1889.)
 Genesis of the Arietidae, Mem. Mus. Comp. Zool.,
 vol. 16, No. 3, p. 238, pl. 14. Cambridge, 1889.

- Halobia** (Bronn) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 30. Phila.,
 1864. W. M. Gabb.

- Halobia? dubia** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, pp. 30, 31, pl. 5,
 figs. 28a, b. Phila., 1864. W. M. Gabb.
 Formation: Triassic.
 Location: Star canyon, Buena Vista district,
 Nev., and Gifford's ranch, Plumas county, Cal.

- **occidentalis** n. s. Whiteaves.
 (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
 ont., vol. 1, pt. 2, pp. 134, 135, pl. 17, figs. 5, 6.
 Montreal, 1889. J. F. Whiteaves.
 Formation: Triassic.
 Location: Liard river, about twenty-five miles
 below Devil's Portage, Canada.

- (**Daonella**) **lommeli** (Wissmann)
 Meek. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
 pp. 100-102, pl. 10, fig. 5. Wash., 1877. F. B.
 Meek.
 Formation: Triassic.
 Location: West of New Pass mines, Desatoya
 mountains, Cottonwood canyon, West Hum-
 boldt range, Nev.

- (**Daonella**) **lommeli** (Wissmann)
 Whiteaves. (1887.)
 Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser.,
 1886, app. I, pp. 108, 109 B. Montreal, 1887.
 J. F. Whiteaves.
 Formation: Triassic.
 Location: South side of Houston Stewart chan-
 nel, Q. C. I.; nearly opposite Rose harbor;
 Section cove, north end of Barnaby island,
 Q. C. I.; bay five miles west of Cape Commeral,
 north end of Vancouver island.

Halobia—Continued.

- (**Daonella**) **lommeli** (Wissmann)
 Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can.
 Paleont., vol. 1, pt. 2, pp. 133, 134. Montreal,
 1889. J. F. Whiteaves.

Formation: Triassic.

Location: South side of Houston Stewart chan-
 nel, Q. C. I.; nearly opposite Rose harbor;
 Liard river, about twenty-five miles below
 Devils Portage, Canada.

Haminea (Leach) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 270, 271.
 Wash., 1876. F. B. Meek.

- **horni** (Gabb?) var. Whiteaves.
 (1879.)

Geol. Sur. Can. Mes. Foss. vol. 1, pt. 2, p. 132,
 pl. 16, figs. 8, 8a, b. Montreal, 1879. J. F.
 Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island;
 southwest side of Denman island; Blundon
 point, and two miles and a quarter up the
 Nanaimo river, Vancouver island; also at
 Vesuvius bay, Admiralty island, and the
 Sucia islands.

- **minor** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 273, pl. 31,
 figs. 1a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Moreau river.

- **occidentalis** (M. & H.) Meek.
 (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 271, 272,
 pl. 18, figs. 11, a, b; 12a, b. Wash., 1876. F.
 B. Meek.
 Formation: Cretaceous.
 Location: Yellowstone river, one hundred and
 fifty miles above its mouth; Deer creek, near
 Platte river.

- **occidentalis** (M. & H.) Whiteaves.
 (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can.
 Paleont., vol. 1, pt. 1, pp. 45, 46. Montreal,
 1885. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Blood Indian creek, north of the Red
 Deer river, and twenty miles east of the Hand
 hills; South Saskatchewan, opposite Swift
 Current creek; Old Wives creek, township 10,
 range 11, west of third principal meridian,
 Canada.

- **subcylindrica** (M. & H.) Meek.
 (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 272, 273,
 pl. 18 figs. 10, a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Near the mouth of Milk river, on the
 Upper Missouri.

- **subcylindrica** (M. & H.) Whitfield.
 (1880.)
 Rep. Geol. Black Hills of Dak., p. 437, pl. 12,
 fig. 24. Wash., 1880. R. P. Whitfield.
 Formation: Cretaceous.
 Location: On Old Woman fork of the Cheyenne
 river, Black hills.

Hamites (Park.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 44. Phila., 1834. S. G. Morton.

— annulifer n. s. Morton. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843, pp. 109, 110. Phila., 1843. S. G. Morton.

Formation: Cretaceous.

Location: Deep cut of the Chesapeake & Delaware canal.

— annulifer n. s. Morton. (1842.)

Jour. Acad. Nat. Sci., Phila., vol. 841st ser., 1839-1842, p. 213, pl. 11, fig. 4. Phila., 1839-1842. S. G. Morton.

Formation: Cretaceous.

Location: Deep cut of the Chesapeake & Delaware canal.

— arculus n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr., U. S., pp. 44, 45, pl. 15, figs. 1, 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Greene county, Ala.

— cylindraceus (?) (Defrance) Whiteaves. (1879.)

Geol. Sur. Can.; Mes. Fos., vol. 1, pt. 2, p. 113, pl. 14, figs. 2-2a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— fremonti n. s. Marcou. (1858.)

Geol. N. Am., p. 36, pl. 1, fig. 3. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Red river, at Preston, Tex.

— (?) glaber n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 213, 214, pl. 24, figs. 2, 2a-c. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet.

— larvatus n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854-1855, pp. 265, 266. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Dallas county [Texas].

— larvatus Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 165, pl. 21, fig. 8. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon springs, Tex.; White river, Ark.

— leaii n. s. Troost. (1840.)

Fifth Geol. Rep. Tenn., p. 53. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: McNairy county, Tenn.

— mortoni n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s. pp. 396, 397, pl. 4, figs. 3a-c. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Near Red Cedar island, thirty-five miles below Fort Pierre.

Hamites—Continued.**— rotundatus n. s. Conrad. (1855.)**

Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 266.

Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Dallas county [Texas].

— torquatus n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 45, pl. 15, fig. 4. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Greene county, Ala.

— ? torquatus (Morton) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 278. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.; Uniontown, Ala.

— trabeatus n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 45, pl. 15, fig. 3. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie bluff, Ala.

— vancouverensis n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 70, 71, pl. 13, fig. 18. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Vancouver island.

— verneuillii n. s. Troost. (1840.)

Fifth Geol. Rep. Tenn., p. 52. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: McNairy county, Tenn.

— (?) sp. undet. Whiteaves. (1876.)

Geol. Sur. Can.; Mes. Foss., vol. 1, pt. 1, p. 48, pl. 9, fig. 3. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte island.

Hamulus n. g. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 73. Phila., 1834. S. G. Morton.

— major n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 399, pl. 68, fig. 46. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— onyx n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 73, 74, pl. 2, fig. 8; pl. 16, fig. 5. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Lynchs creek, S. C.; Erie, Ala.; New Jersey.

— squamosus Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 398, pl. 58 [68], fig. 45. Phila., 1858-1860. W. M. Gabb.

Haploceras beaudanti (Brong.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 205-207, pl. 26, figs. 1, 1a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet, Form A; north shore of Cumshewa inlet, Form B.

Haploceras—Continued.— **cumshewaense** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 208, 209, pl. 24, fig. 1. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet.

— **perezianum** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, p. 204. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South island, Skidegate channel; north shore of Cumshewa inlet.

— **planulatum** (Sow. sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, pp. 207, 208, pl. 28, fig. 1. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet.

Haplophragmium sp. Reuss. (1861.)

Math.-Naturw. cl. Kaiserl. Akad. Wiss. Sitzungst., 1861, Band XLIV, p. 336. Wien, 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

— Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungst., 1861, Band XLIV, p. 336. Wien, 1862. A. E. Reuss.

Haploscapa Conrad. (1875.)

Proc. Acad. Nat. Sci., Phila., for 1875, p. 467. Phila., 1875. T. A. Conrad.

— **capax** n. s. Conrad. (1874.)

Seventh Ann. Rep. U. S. Geol. and Geogr. Sur. Ter., p. 456. Wash., 1874. T. A. Conrad.

Formation: Cretaceous.

Location: Near Denver, Colo.

Harpago (Klein) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331. Phila., 1855-1858. T. A. Conrad.

— **tippanus** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331, pl. 35, fig. 25. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Haydenia n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 98. Phila., 1864. W. M. Gabb.

— **impressa** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 98, pl. 18, fig. 51. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Tehama county, and Pence's ranch, Butte county, Cal.

BULL. 102—10

Helcion (Montfort) M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

— **alveolus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, Nebr.

— **carinatus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 68, 69. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, Nebr.

— **circularis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 141, pl. 29, figs. 234, 234a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

— **dichotoma** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 141, pl. 21, fig. 104. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— **patelliformis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from mouth, Nebr.

— **sexsulcatus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone, one hundred and fifty miles from mouth, Nebr.

— **striatum** n. s. Eichwald. (1871.)

Geog. Paleont., Bemerk. Halb. Mang. Aleutischen Inseln, pp. 156, 157, Taf. 12, fig. 4. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— **suboratus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 68. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, Nebr.

Helicancylus n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 140, 141. Phila., 1869. W. M. Gabb.

— **æquicostatus** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 141-143, pl. 25, figs. 20a-9. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

Helicaulax n. g. Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 145. Phila., 1868. W. M. Gabb.

— **bicarinata** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 166, 167, pl. 27, fig. 47. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

Helicaulax—Continued.

- **costata** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 167, pl. 28, fig. 48. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- Helicoceras** (d'Orb.) Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 190. Boston, 1862. B. F. Shumard.
- **angulatum** n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 176. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Head of the south branch of Cheyenne river, Nebr.
- **declive** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 73, pl. 28, figs. 200, 200a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Pences ranch, Butte county, Cal. (Div. A.)
- **brewerii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 72, pl. 14, figs. 22, 22a, b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Pences ranch, twelve miles north of Oroville, Butte county, Cal.
- **pariense** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. West of one hundredth meridian, vol. 4, pt. 1, pp. 203, 204, pl. 19, figs. 2a, d. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Southeast of Paria, Utah.
- **mortoni** (M.) Stanton. (1887.)
Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 187. [Denver, 1888.] T. W. Stanton.
Formation: Cretaceous.
Location: About five miles north of the town of Boulder, Colo.
- **mortoni** var. **teniucostatum** n. var. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 487-489, pl. 22, figs. 3a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri river, below Fort Pierre.
- **navarroensis** n. s. Shumard. (1861.)
Proc. Bos. Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 190, 191. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Chatfield point, Navarro county, Tex.
- **stevensoni** n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. Region: Prelim. Rep. Paleont., Black Hills, pp. 39, 40. Wash., 1879. R. T. Whitfield.
Formation: Cretaceous.
Location: On the west side of Beaver creek, southwest Black hills.
- **stevensoni** Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 447-449, pl. 14, figs. 5-8. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the west side of Beaver creek, Black hills.

Helicoceras—Continued.

- **stevensoni** (Whitfield.) Stanton. (1887.)
Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 187. [Denver, 1888.] T. W. Stanton.
Formation: Cretaceous.
Location: About five miles north of the town of Boulder, Colo.
- **tenuicostatus** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 56. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **? tortus** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, pp. 54, 55. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **? vermicularis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 71, 72, pl. 13, figs. 19, 19a, b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Hill southwest of Martinez, in Contra Costa county, Cal.
- **vespertinus** n. s. Conrad. (1874.)
Seventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 455. Wash., 1874. T. A. Conrad.
Formation: Cretaceous.
Location: Seven miles southeast of Fairplay, Colo.
- Helisoma** (subgen. Swain) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 535. Wash., 1876. F. B. Meek.
- Helix** (Linn) White. (1876.)
Rep. Geol. Uinta Mts., p. 120. Wash., 1876. C. A. White.
- (Linn, typical) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 549. Wash., 1876. F. B. Meek.
- **evansi** n. s. [M] & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 175. Phila., 1861. Meek & Hayden.
Formation: [Tertiary] Cretaceous.
Location: Mouth of Judith river, Nebr.
- **evanstonensis** n. s. White. (1878.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 714. Wash., 1878. C. A. White.
Formation: Cretaceous.
Location: Near Evanston, Wyo.
- **evanstonensis** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Evanston coal mines, Wyo.
- **evanstonensis** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 48, pl. 27, figs. 29-31. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Evanston, Wyo.
- **kanabensis** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 120. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Upper Kanab, Utah.

Helix—Continued.

- **kanabensis** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 48, pl. 25,
figs. 12-14. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southern Utah.
- **occidentalis** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 135.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.
- **vetusta** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 552, pl. 42,
figs. 7a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **vetusta** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 552, pl. 42,
figs. 7a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, on the Missouri.
- **vetusta** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 88. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- ? **vetusta** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 48, pl. 27,
fig. 28. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **vitrinoides** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 135.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.
- (**Patula**) **sepulta** n. s. White. (1880.)
Proc. U. S. Nat. Mus., vol. 3, p. 160. Wash.,
1880. Smithsonian. Misc. Coll., vol. 22. Wash.,
1882. C. A. White.
Formation: Cretaceous.
Location: Evanston, Wyo.
- Hemiaster** (Desor) d'Orb. (1853.)
Paleont. Francaise. Echinoides Irreguliers, Terr.
Cret. 1, Sixieme, pp. 220-223. Paris, 1853-1860.
A. d'Orbigny.
- Desor. (1858.)
Synop. Echinoides Foss., p. 367. Paris and Wies-
bade, 1858. E. Desor.
- **elegans** Shumard. (1853.)
Expl. Red river Louisiana, by R. B. Marcy, p.
210, pl. 2, figs. 4a-c. Wash., 1853. B. F. Shu-
mard.
Formation: Cretaceous.
Location: Fort Washita, Ind. T.
- ? **humphreysanus** n. s. (M. & H.) (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, pp. 147,
148. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, Nebr.

Hemiaster—Continued.

- **humphreysanus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 5, 6, pl. 10,
figs. 1a-g. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Upper Missouri.
- **parastatus** (Mont.) Marcou. (1853.)
Geol. map of the U. S. and British Provinces of
N. A., p. 47, pl. 7, fig. 8. Boston, 1853. Jules
Marcou.
Formation: Cretaceous.
Location: Timber creek, N. J.
- **parastatus** (Morton sp.) Desor. (1858.)
Synop. Echinoides Foss., pp. 373, 374. Paris and
Wiesbade, 1858. E. Desor.
Formation: Cretaceous.
Location: Prairie bluff, Ala.
- **stella** (Morton sp.) Desor. (1858.)
Synop. Echinoides Foss., p. 373. Paris and Wies-
bade, 1858. E. Desor.
Formation: Cretaceous.
Location: Prairie bluff, Ala., and Timber creek,
N. J.
- **texanus** n. s. Roemer. (1849.)
Texas, p. 393. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall near New Braunfels, Tex.
- **texanus** Roemer. (1852.)
Kreide von Tex., p. 85, Taf. 10, figs. 4a-c. Bonn,
1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New
Braunfels, Tex.
- **stella** (Desor) d'Orb. (1875.)
Paleont. Francaise, Echinoides Irreguliers, Terr.
Cret. 1, Sixieme, pp. 245, 246, pl. 882. Paris,
1853-1860. A. d'Orbigny.
Formation: Cretaceous.
Location: Prairie bluff, Ala., Timber creek, N. J.
- Hemicidaris** sp. undet. Hill. (1889.)
Geol. Sur. Tex., Bull., No. 4, p. 2, Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: West of Austin, Tex.
- Hemifusus** subgen. (Swains.) Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 86. Phila.,
1864. W. M. Gabb.
- Hercodon** n. g. Conrad. (1875.)
Rep. Geol. Sur. N. Carolina, vol. 1. Raleigh, 1875,
W. C. Kerr., App. A, p. 10. T. A. Conrad.
- **ellipticus** n. s. Conrad. (1875.)
Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C.
Kerr., App. A, p. 10, pl. 2, figs. 2, 8. T. A.
A. Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.

Hercoglossa (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 491. Wash., 1876. F. B. Meek.

Hercorhynchus n. g. Conrad. (1868.)

Am. Jour. Conch., vol. 4, p. 247. Phila., 1868. T. A. Conrad.

— **tippana** Conrad. (1868.)

Am. Jour. Conch., vol. 4, p. 247. Phila., 1868. T. A. Conrad.
Formation: Cretaceous.

Heteroceras (d'Orb.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 477, 478. Wash., 1876. F. B. Meek.

— ? **angulatum** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 484, 485, pl. 21, figs. 3a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Head of south branch of Cheyenne river, Dak.

— ? **cheyennense** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 483, 484, pl. 21, figs. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Big Cheyenne river, Dak.

— ? **cochleatum** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 478, 479, pl. 22, figs. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri, below Fort Pierre, Dak.

— **cochleatum** (M. & H.) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 187. [Denver, 1888.] T. W. Stanton.
Formation: Cretaceous.
Location: About five miles north of the town of Boulder, Colo.

— **conradi** (Mort. sp.) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 100-102, pl. 12. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornsby island; Trent river (above and below the falls); Bradley creek, V. I.; Salt spring or Admiralty island; Maple bay, Vancouver island.

— **cooperi** (Gabb) (sp.) Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 367, pl. 3, figs. 7, 7a. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, Vancouver island.

— ? **nebrascense** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 480, 481, pl. 22, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Near the Forks of Cheyenne river, Dak.

Heteroceras—Continued.— ? **nebrascense** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 451, 452, pl. 15, fig. 6; pl. 14, fig. 9. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the west side of the east fork of Beaver creek, Black hills.

— **nebrascense** (M. & H.) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 186. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

— **newtoni** n. s. Whitfield. (1879.)

U. S. Geogr. and Geol. Sur., Rocky Mountain region; Prelim. Rep. Paleont., Black Hills, pp. 40, 41. Wash., 1879. R. P. Whitfield.

Formation: Cretaceous.

Location: On the west side of Beaver creek, southwest Black hills.

— **newtoni** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 449-451, pl. 15, figs. 1-4. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the west side of Beaver creek, Black hills.

— **tortum** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 481, 482, pl. 22, figs. 4a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri below Fort Pierre, Dak.

— **tortum** (M. & H?) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, pp. 186-187. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

— ? **umbilicatum** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 482, 483, pl. 22, fig. 5. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri below Fort Pierre, Dak.

Heterocrisina n. g. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., 2d ser., 1858-1860, p. 404. Phila., 1858-1860. Gabb & Horn.

— **abbottii** n. s. G. & H. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 404, pl. 69, figs. 45-47. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Near Mullica hill, N. J.

Heterotermia n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 151, 152. Phila., 1869. W. M. Gabb.

Heterotermia—Continued.— **trochoidea** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 152, pl. 26, figs.

30, 30a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Hettangia americana n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 274.

Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

Hindsia nodulosa Whiteaves sp. (1879.)

Geol. Sur. Cal. Mes. Foss., vol. 1, pt. 2, pp. 125-

127, pl. 15, figs. 6 and 7. Montreal, 1879. J. F.

Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, two miles and a half up, Vancouver island; Protection island.

Hinnites ? sp. undet. Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo 3, p. 656,

Lam. 1, fig. 4. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojada, Mexico.

Hinnites, or **Spondylus** sp. undet. Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 175.

Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Entrance to Departure bay, Vancouver island.

Hipponyx [DeFrance] Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser. 1839-

1842, p. 210. Phila., 1839-1842. S. G. Morton.

— **borealis** n. s. Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, ser., 1839-

1842, p. 210, pl. 11, fig. 6. Phila., 1839-1842.

S. G. Morton.

Formation: Cretaceous.

Location: Great bend of the Missouri river (Lat. 43° 40' N.).

Hippothoa irregularis n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 366.

Phila., 1861. Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

— **n. g.** Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-

1860, p. 400. Phila., 1858-1860. W. M. Gabb.

— **irregularis** (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-

1860, p. 400, pl. 69, figs. 18-20. Phila., 1858-

1860. W. M. Gabb.

Formation: Cretaceous.

Location: Timber creek, N. J.

— ? **G. & H.** (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,

1863, p. 179 [pl. 21], fig. 71. Phila., 1862, 1863.

Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

Hippurites (Lam.) Barcena. (1877.)

An. Museo. Nac. Mex., Tomo 1, p. 196, Mexico,

1877-1879. M. Barcena.

— **austinensis** n. s. Roemer. (1849.)

Tex., p. 410. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Austin, Tex.

— **bioculatus** (Lam.) Urquiza. (1882.)

An. Min. Fomento Rep. Mex., Tomo 7, p. 222, figs.

1a, 2a. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Coalcoman district, state of Michoacan, Mexico.

— **calamitiformis** Barcena.* (1877.)

An. Museo. Nac. Mex., Tomo 1, pp. 197, 198, fig.

15. Mexico, 1877-1879. M. Barcena.

Formation: Cretaceous.

Location: Cadereyta and Apasco, state of Quere-taro, Mexico.

— **calamitiformis** (Barcena) Urquiza. (1882.)

An. Min. Fomento Rep. Mex., Tomo 7, pp. 222,

223, fig. 3a. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Road to Rincon mine, Coalcoman district, state of Michoacan, Mexico.

— **mexicana** Barcena. (1877.)

An. Museo. Nac. Mex., Tomo 1, pp. 196, 197, figs.

11-14. Mexico, 1877-1879. M. Barcena.

Formation: Cretaceous.

Location: Apasco, state of Mexico; Yantepec, state of Morelos; Sierra de Barbosa and Cañada Grande, state of San Luis Potosi, Mexico.

— **mexicana** (Barcena) Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo 3, pp. 655,

656, Lam. 1, fig. 1a. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojada, Mexico.

— **mexicana** [Barcena] Urquiza. (1882.)

An. Min. Fomento Rep. Mex., Tomo 7, p. 223,

figs. 4, 5. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Road to Rincon mine and San Gsidro, Coalcoman district, state of Michoacan, Mexico.

— **sabinae** n. s. Roemer. (1849.)

Tex., p. 410. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Sabine creek on road from New Braunfels to Fredericksburg, Tex.

— **texana** n. s. Roemer. (1849.)

Tex., pp. 409, 410. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Upper course of Pedernales river, Tex.

— **texanus** Roemer. (1852.)

Kreide von Tex., pp. 76, 77, Taf. 5, figs. 1a-a.

Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Boulder in the Guadalupe near New Braunfels, Tex.

* (n. s. ?) See datos para el estudio de las arcar Mesozoicos des Mexico, etc., 1874.

Hippurites—Continued.

- *sp. undet.* Roemer. (1849.)
 Tex., p. 410. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Well at New Braunfels, Tex.
- *sp. undet.* Roemer. (1852.)
 Kreide von Tex., p. 77. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: New Braunfels, Tex.
- *sp. undet.* Urquiza. (1882.)
 An. Min. Fomento Rep. Mex., Tomo 7, p. 223, fig. 6. Mexico, 1882. M. Urquiza.
 Formation: Cretaceous.
 Location: San Isidro, Coalcoman district, state of Michoacan, Mexico.

Holaster (Agas.) Conrad. (1850.)

- Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 40. Phila., 1850-1854. T. A. Conrad.
- *cinctus* (Mort. sp.) Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges., Band 22, p. 218. Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Brownville, N. J.
- *comanchesi* n. s. Marcou. (1858.)
 Geol. N. Am., pp. 40, 41, pl. 3, figs. 3, 3a, b. Zurich, 1858. Jules Marcou.
 Formation: Cretaceous.
 Location: Borders of Red river, near Preston, Tex.
- *comanchesi* (Marcou) Desor. (1858.)
 Synop. Echinoides Foss., p. 449. Paris and Wiesbade, 1858. E. Desor.
 Formation: Cretaceous.
 Location: Bank of Red river, near Preston, Tex.
- *mortoni* (Couper MSS.) Conrad. (1850.)
 Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 40, pl. 1, fig. 10. Phila., 1850-1854. T. A. Conrad.
 Formation: Eocene [Cretaceous].
 Location: Palmyra, Lee county, Ga.
- *simplex* n. s. Shumard. (1853.)
 Expl. Red River, La., by R. B. Marcy, pp. 210, 211, pl. 3, fig. 2. Wash., 1853. B. F. Shumard.
 Formation: Cretaceous.
 Location: Fort Washita, Ind. T.
- *simplex* (Shumard) Desor. (1858.)
 Synop. Echinoides Foss., p. 450. Paris and Wiesbade, 1858. E. Desor.
 Formation: Cretaceous.
 Location: Red river [Tex].

Holactypus Desor. (1858.)

- Synop. Echinoides Foss., pp. 168, 169. Paris and Wiesbade, 1858. E. Desor.
- *sp.* Roemer. (1888.)
 Paleont. Abhandl. Vierter Band., Heft 4, p. 9, Taf. 1 [xxx1] figs. 6a-6c. Berlin, 1888. F. Roemer.
 Formation: Cretaceous.
 Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

Holactypus—Continued.

- *castilloi* n. s. Cotteau. (1890.)
 Bull. Soc. Geol. France, 3d ser., vol. 18, No. 4, pp. 295, 296, pl. 1. Paris, 1890. Cotteau.
 Formation: Cretaceous.
 Location: Jalpa (Jalisco).
- *castilloi* n. s. Cotteau. (1890.)
 Bull. Soc. Geol. France, 3d ser., vol. 18, pp. 295, 296, pt. 1. Paris, 1890. Cotteau.
 Formation: Cretaceous.
 Location: Jalpa (Jalisco), Mexico.
- *planatus* n. s. Roemer. (1849.)
 Tex., p. 393. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg and San Saba river, Tex.
- *planatus* Roemer. (1852.)
 Kreide von Tex., p. 84, Taf. 10, figs. 2a-9. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg and San Saba valley, fifteen miles below old Spanish fort, Tex.
- *planatus* (Roem.) Shumard. (1853.)
 Expl. Red River, La., by R. B. Marcy, p. 211. Wash., 1853. B. F. Shumard.
 Formation: Cretaceous.
 Location: Cross Timbers, Tex.
- *planatus* n. s.? Hall. (1854.)
 Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 145, 146, pl. 1, figs. 4a-f. Wash., 1857. James Hall.
 Formation: Cretaceous.
 Location: Leon springs, Tex.
- *planatus* (Roemer) Desor. (1858.)
 Synop. Echinoides Foss., p. 174. Paris and Wiesbade, 1858. E. Desor.
 Formation: Cretaceous.
 Location: Fredericksburg and San Saba river, Tex.
- Homalina** (subgen. Stoliczka) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 194. Wash., 1876. F. B. Meek.
- Homomya** (Agas.) Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 179. Phila., 1869. W. M. Gabb.
- *alta* n. s. Roemer. (1852.)
 Kreide von Tex., p. 45, Taf. 6, fig. 11. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg, Tex.
- *concentrica* Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 179. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Tuscan springs, Cottonwood creek, and Martinez, Cal.
- *concentrica* (Gabb) Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 141. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Sucia islands.

Homomya—Continued.— *sp. undet.* Roemer. (1849.)

Tex. p. 408. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Hoploparia (?) canadensis n. s. Whiteaves. (1884.)

Proc. and Trans. Roy. Soc. Can., vol. 2, Sec. 4, pp. 237, 238. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Highwood river, Alberta, Northwest Territory.

— *? canadensis* Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 87-89, pl. 11. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Highwood river (a tributary of the Bow river), ten miles west of the first fork, Canada.

Hyalina (Ferussæ) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 545-547. Wash., 1876. F. B. Meek.

— *? evansi (M. & H.) Meek.* (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 548, 549, figs. 68-70, p. 548. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Mont.

— *? evansi (M. & H.) White.* (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 46, pl. 27, fig. 26. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— *? occidentalis (M. & H.) Meek.* (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 547, 548, pl. 42, figs. 6a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Mont.

— *? occidentalis (M. & H.) White.* (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 87, 88. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: [Mouth of Judith river, Mont.]

— *? occidentalis (M. & H.) White.* (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 87, 88. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: [Mouth of Judith river, Mont.]

— *? occidentalis (M. & H.) White.* (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 46, pl. 27, fig. 27. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Hydatina parvula Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 180, 181, pl. 24, figs. 5, 5a. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sounding creek, township 30, range 8, west of the fourth principal meridian, Northwest Territory.

Hydrobia (Hartmann) Meek. (1876.)

Report U. S. Geol. Sur. Terr., vol. 9, p. 571. Wash., 1876. F. B. Meek.

— *anthonyi (M. & H.) White.* (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 97. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— *anthonyi (M. & H.) Meek.* (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 571, 572, pl. 43, figs. 10a-d. Wash., 1876. F. B. Meek.

Formation: Probably Eocene. [Cretaceous.]

Location: Yellowstone river, thirty miles above its mouth.

— *anthonyi (M. & H.) White.* (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 59, pl. 27, fig. 38. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— *? eulimoides n. s. Meek.* (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 573, 574, fig. 78, p. 573. Wash., 1876. F. B. Meek.

Formation: Probably Eocene. [Cretaceous.]

Location: Clear fork of Powder river, Mont.

— *? eulimoides (M. & H.) White.* (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 97. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— *? eulimoides (Meek) White.* (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 59, pl. 27, fig. 37. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— *recta n. s. White.* (1876.)

Rep. Geol. Uinta Mts., p. 132. Wash., 1876. C. A. White.

Formation: Tertiary. [Cretaceous.]

Location: Almy coal mines, near Evanston, Wyo.

— *recta* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 245. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coal mines three miles from Evanston, Wyo.

— *recta* White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 60, pl. 27, fig. 38. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Evanston, Wyo.

Hydrobia—Continued.— **subconica** n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 573, fig. 77,
p. 573. Wash., 1876. F. B. Meek.

Formation: Probably Eocene. [Cretaceous.]

Location: Mouth of Judith river, Mont.

— **subconica** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 97. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **subconica** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 59, pl. 27,
fig. 36. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **subcylindracea** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, pp. 75, 76, pl. 10, fig. 8. Mont.,
1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, east side of Driftwood
bend; north side of Milk river, five miles below
Pa-kow-ki coulee, Can.

— **utahensis** n. s. White. (1876.)

Rep. Geol. Unita Mts., pp. 132, 133. Wash., 1876.
C. A. White.

Formation: Tertiary [Cretaceous].

Location: West base of Mu-si-ni-a plateau, 1,000
feet below the summit, Utah.

— **utahensis** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 60, pl. 27,
fig. 35. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Utah.

— **warrenana** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 572, 573,
pl. 43, figs. 11a-c. Wash., 1876. F. B. Meek.

Formation: Probably Eocene [Cretaceous].

Location: Thirty miles below Fort Clarke, Dak.,
from the summit of Squares butte.

— **warrenana** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 97. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **warrenana** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 59, pl. 27, fig.
40. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— — ? Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, p. 23. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: North or second branch of the Milk
river; Old Man river, two miles above Rye-Grass
flat; Pincher creek, Canada.

Hypogella (Gray) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 175. Phila.,
1869. W. M. Gabb.

Hyridella (subgen. Swain) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash.,
1876. F. B. Meek.

Ichthyosarcolithes anguis Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, pp. 9,
10, Taf. I [xxvi], figs. 7a, 7b; Taf. II [xxxii],
figs. 2a-2d. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons
creek, near Austin, Tex.

Idmonea G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 167. Phila., 1862, 1863. Gabb & Horn.

— **contortilis** n. s. Lonsdale. (1884.)

Quart. Jour. Geol. Soc., London, vol. 1, pp. 68, 69,
figs. a-e, p. 68. London, 1845. William Lonsdale.

Formation: Cretaceous.

Location: Timber creek, N. J.

— **contortilis** (Lonsd.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 167. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, and near Mullica hill,
N. J.

Idonearca n. g. Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 54.
Phila., 1872. T. A. Conrad.

— (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 84. Wash.,
1876. F. B. Meek.

— **alabamensis** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 315.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluffs, Ala.

— ? **antrosa** (Mort. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 315.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **antrosa** (Mort.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 96-98, pl. 13,
figs. 6-11. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Marlboro, Monmouth county; near
Holmdel; Freehold, N. J.

— **capax** Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 54, pl. 2,
fig. 2. Phila., 1872. T. A. Conrad.

Formation: Cretaceous.

— **carolinensis** [n. s.] Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 314,
315. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Snow hill, N. C.

Idonearca—Continued.

- **compressirostra** n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 199, 200, pl. 26
figs. 15, 16. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Mr. J. S. Cook's pits, Tinton falls,
Monmouth county, N. J.
- **depressa** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, pp. 183, 184,
pl. 18, figs. 13a, b. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: East bank of Rio Puerco, six miles be-
low Casa Salazan, N. Mex.
- **littlei** n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 316.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Ga.
- **medians** n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 199, pl. 26, figs.
5, 6. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Cook's marl pits at Tinton falls, N. J.
- **neglecta** (Gabb sp.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 314.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey; Prairie bluff, Ala.
- **quindecimradiata** (—) Cook. (1868.)
Ann. Rep. Geol. Sur. N. J., for 1868, p. 376,
fig. —, p. 376. Newark, 1868. G. H. Cook.
Formation: Cretaceous.
Location: New Jersey.
- **shumardi** (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 405, 406, pl.
11, figs. 8-11. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Old
Woman fork, Black hills.
- **tippana** (Con.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 95, 96, pl. 12,
figs. 19-21. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Deep cut of the Holmdel and Keyport
turnpike, Monmouth county, N. J.
- **vulgaris** (Mort. sp.) Cook. (1868.)
Ann. Rep. Geol. Sur. N. J., for 1868, p. 376, fig. —.
Newark, 1868. G. H. Cook.
Formation: Cretaceous.
Location: New Jersey.
- **vulgaris** (Morton sp.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 313.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- **vulgaris** (Mort.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 98, 99, pl. 13,
figs. 1-5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel, Freehold, Woodbury, Bur-
lington, Mullica hill, Marshallville, N. J.

Idonearca—Continued.

- **sp. ?** Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 315,
316. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- Inoceramus** [Sowerby] Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 62. Phila.,
1834. S. G. Morton.
- (subgen. Sowerby) typical, Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 38, 39.
Wash., 1876. F. B. Meek.
- **altus** n. s. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 302, 303. Wash., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Near Medicine Bow station, Union Pa-
cific railroad.
- **altus** (Meek) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 391, pl. 9, fig.
11. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Belle Fourche, ten miles west
of Crow Peak, Black hills.
- **altus** (Meek) Whiteaves. (1885.)
Geol. and Nat. His. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 1, p. 33. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: East fork of the Milk river, Canada.
- **alveatus** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 63, pl. 17,
fig. 4. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Greene county, Ala.
- **ambiguus** n. s. Eichwald. (1871.)
Geogr. Paleont. Bemerk. Halb. Mang. Aleutischen
Inseln, pp. 189-191, Taf. 20, figs. 1-5, St. Peters-
burg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **argenteus** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser.,
1855-1858, p. 329, pl. 34, fig. 16, Phila., 1855-
1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.
- **aviculoides** n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 181,
Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Little Blue river, Nebr.
- **balchii** n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 180,
181. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: White river above the Mamais Terres,
Terres, Nebr.

Inoceramus—Continued.— **barabini** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 62, 63, pl. 17, fig. 3; pl. 13, fig. 11. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Greene county, Ala.

— **barabini** Morton. (1841.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 211. Phila., 1839-1842. S. G. Morton.

Formation: Cretaceous.

Location: Great bend of the Missouri river (Lat. 43° 40' N.).

— **barabini** (Mort.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 180, 181, pl. 16, fig. 4a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: One and a quarter miles south of Boulder, Colo., and at Gallinas creek, N. Mex.

— **barabini** (Morton) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 205. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colo.

— **barabini** (Morton) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 224. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near White River Indian agency, Colo.

— **barabini** (Mort.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 398-400, pl. 7, fig. 7; pl. 9, fig. 8. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Cheyenne river, near Boxelder creek, and on Beaver creek, two to three miles west of the Black hills.

— **barabini** (Mort.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 75, 76, pl. 15, figs. 3-5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Marlboro, N. J.

— **barabini** (Mort.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 33. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Twelve miles east of White Mud river (or Frenchmans creek); Elbow of South Saskatchewan, Canada.

— **brownii** n. s. Cragin. (1889.)

Bull. Washb. Coll. Lab. Nat. His., vol. 2, No. 10, pp. 67, 68. Topeka, 1889. F. W. Cragin.

Formation: Cretaceous.

Location: Fort Hays limestone, and at some ten to twenty feet above the base of the latter, at a locality, known as "Devils gap," near the post office of Tapley, in Osborne county, Kans.

— **canadensis** n. s. Meek. (1859.)

N. W. Terr., Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind., pp. 183, 184, pl. 1, figs. 4 and 4. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: Little Souris river, Canada.

Inoceramus—Continued.— **capulus** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 606. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Lamar county, Tex.

— **concentricus** (Parkinson) Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 79, 80. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **concentricus** (Parkinson) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 341. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumsheewa inlet; Skidegate inlet, at Bear Skin bay; South island.

— **confertim-annulatus** n. s. Roemer. (1849.)

Tex., p. 402. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford near New Braunfels, Tex.

— **confertim-annulatus** Roemer. (1852.)

Kreide von Tex., p. 59, Taf. 7, fig. 4. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, New Braunfels, Tex.

— **confertim-annulatus** (Roemer.) Shumard. (1853.)

Expl. Red River, La., by R. B. Marcy, p. 206, pl. 6, fig. 2. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Camp No. 4, Cross timbers, Tex.

— **confertim-annulatus** (Roem.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 151, pl. 5, figs. 5. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Near New Braunfels, Tex.

— **confertim-annulatus** (Roemer.) Schiel. (1855.)

Rep. Expl. and Sur. P. R. R., Mississippi river to Pacific ocean, vol. 2; Rep. Expl. forty-first parallel north latitude, p. 108, pl. 2, fig. 7. Wash., 1855. James Schiel.

Formation: Cretaceous.

Location: Upper Green river county.

— **conradi** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 387, 388, pl. 2, fig. 5a, b. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: On the Missouri river, five miles below the mouth of the Vermilion river.

Inoceramus—Continued.

- **convexus** n. s. H. & M. (1854.)
 Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 386, 387, pl. 2, figs. 2a, b. Cambridge and Boston, 1855. Hall & Meek.
 Formation: Cretaceous.
 Location: Sage creek.
- **costellatus** n. s. Conrad. (1858.)
 Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 329, pl. 34, fig. 12. Phila., 1855-1858. T. A. Conrad.
 Formation: Cretaceous.
 Location: Owl creek, three miles north of the town of Ripley, Miss.
- **crassalatus** n. s. White. (1875.)
 Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, p. 166, pl. 13, figs. 4a-c. Wash., 1875. C. A. White.
 Formation: Jurassic.
 Location: North fork of Virgin river, Utah.
- **crippsii** (Mantell) Roemer. (1849.)
 Tex., p. 401. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Ford near New Braunfels, Tex.
- **crippsii** (Mantell) Roemer. (1852.)
 Kreide von Tex., pp. 56-58, Taf. 7, fig. 2. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Ford of the Guadalupe, New Braunfels, and crossing of the Cibolo between New Braunfels and San Antonio, Tex.
- **crippsii** var. **barabini** (Mort.) Whiteaves. (1879.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 173, 174. Montreal, 1878. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Sucia islands.
- **crippsii** (?) var. **subundatus** Meek. (1876.)
 Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 358, 359, pl. 3, figs. 1, 1a and 3, 3a, [2 figs. in text.] Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Sucia island.
- **crippsii** var. **suciensis** n. var. Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 173. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Southwest side of Denman island.
- **crippsii** var. **proximus** (Tuomey) Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 172, 173. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Lower part of the Trent river, Naniamo river, two miles and a quarter up, and Blunden point, Vancouver island, Sucia islands.
- **crippsii** (Mantell) Conrad. (1857.)
 Rep. U. S. and Mex. Bound. Sur., vol. 1, pl. 2, p. 152, pl. 5, fig. 8. Wash., 1857. T. A. Conrad.
 Formation: Cretaceous.
 Location: San Antonio, Tex., Green county, Ala.

Inoceramus—Continued.

- **crippsii** (?) (Mantell) Newberry. (1861.)
 Rep. Colorado River of the West, pt. 3, p. 119. Wash., 1861. J. S. Newberry.
 Formation: Cretaceous.
 Location: At the Moqui villages.
- **cuneatus** n. s. M. & H. (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, p. 180. Phila., 1861. Meek & Hayden.
 Formation: Cretaceous.
 Location: Yellowstone river, one hundred and fifty miles above the mouth, Nebr.
- **cuneiformis** (d'Orb) Eichwald. (1871.)
 Geog. Paleont. Bemerck. Halb. Mang. Aleutischen Inseln, pp. 195, 195. St. Petersburg, 1871. E. Eichwald.
 Formation: Cretaceous.
 Location: Alaskan peninsula.
- **deformis** (Meek) White. (1875.)
 Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 179, 180, pl. 15, figs. 1a-b. Wash., 1875. C. A. White.
 Formation: Cretaceous.
 Location: Five miles above Pueblo, Colo.
- **deformis** Meek. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 146-148, pl. 14, figs. 4, 4a. Wash., 1877. F. B. Meek.
 Formation: Cretaceous.
 Location: Common in Kansas, and near Pueblo and Colorado city, as well as at other places in Colorado along eastern base of Rocky mountains, and farther west; everywhere in the Benton and Niobrara groups.
- **deformis** (Meek) White. (1878.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Bear creek, near Morrison, Colo.
- **dimidius** n. s. White. (1874.)
 Prelim. Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, G. M. Wheeler, pp. 25, 26. Wash., 1874. C. A. White.
 Formation: Cretaceous.
 Location: Ojodel Pescado, N. Mex.
- **dimidius** n. s. White. (1874.)
 Prelim. Rep. Invert. Foss. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, pp. 25, 26. Wash., 1874. C. A. White.
 Formation: Cretaceous.
 Location: Ojodel Pescado, N. Mex.
- **dimidius** White. (1875.)
 Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 181, 182, pl. 16, figs. 2a-d. Wash., 1875. C. A. White.
 Formation: Cretaceous.
 Location: Ojodel Pescado, N. Mex.
- **elliottii** n. s. Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 193, pl. 31, fig. 90a. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Alcatraz island, San Francisco harbor, Cal.

Inoceramus—Continued.**—erectus n. s. Meek. (1870.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 145, pl. 13, figs. 1, 1a; pl. 14, fig. 3. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Chalk creek, near Uptown, Utah.

—erectus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

—eximius n. s. Eichwald. (1871.)

Geogr. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 192-194, Taf. 18, figs. 1-4; Taf. 19, figs. 3, 4. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: South coast of Tukusitnu bay, Alaska.

—exogyroides n. s. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, pp. 26, 27. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the Missouri river.

—flacidus White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 178, 179, pl. 16, figs. 1a, b. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Five miles above Pueblo, Colo.

—fragilis n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 388, pl. 2, figs. 6, a, b. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: On the Missouri river, five miles below the mouth of Vermilion river.

—fragilis (H. & M.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, p. 178, pl. 15, fig. 3a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

—fragilis (H. & M.) Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. M., to junction of Grand and Green rivers, p. 127. pl. 1, fig. 6. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Vado del Chama.

—fragilis (H. & M.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 390, 391, pl. 9, fig. 10. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Beaver creek, and on the eastern fork of the same, Black hills.

—gilberti n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 113, 114. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Near Last Chance creek, southern Utah.

Inoceramus—Continued.**—gilberti White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 285, pl. 3, figs. 1a, c. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Last Chance creek, southern Utah.

—howelli n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 114, 115. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Lower Potato valley and Upper Pine creek, Utah.

—howelli White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 229. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Dodd's ranch, on Ashley's fork, Utah.

—howelli White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 284, 285, pl. 4, figs. 1a-c. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

—incurvus n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 277. Phila., 1837. Meek & Hayden.

Formation: Cretaceous.

Location: Little Bear's village, between Fort Pierre and Fort Clark, Nebr.

—latus (Mantell) Roemer. (1849.)

Tex., pp. 401, 402. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford and waterfall near New Braunfels, Tex.

—latus (Mantell) Roemer. (1852.)

Kreide von Tex., p. 60. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, New Braunfels, Tex.

—lerouxii n. s. Marcou. (1858.)

Geol. N. Am., pp. 36, 37, pl. 2, fig. 3. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Ravines along the Rio Galisteo, N. Mex., precisely at the point where the road from Santa Fe to Algodones crosses the Rio.

—lucifer n. s. Eichwald. (1871.)

Geogr. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 194, 195, Taf. 18, figs. 5-7. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: South coast of Tukusitnu bay, Alaska.

—moresbyensis nom. prov. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 240, 241, fig. 11, p. 240. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet, Moresby island.

Inoceramus—Continued.**— mytiloides (Mantell) Roemer. (1849.)**

Tex., p. 401. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Ford and waterfall near New Braunfels, Tex.

— mytiloides (Mantell) Roemer. (1852.)

Kreide von Tex., p. 60, Taf. 7, figs. 5. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford and waterfall of the Guadalupe, near New Braunfels, Tex.

— mytilopsis n. s. Conrad. (1854.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 152, pl. 5, figs. 6a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: [Texas.]

— mytilopsis (Con.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 169, 170, pl. 20, fig. 3. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo and Valdez inlet; Trent river, Vancouver island above the falls; Bradley creek.

— nebrascensis n. s. Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., p. 582, pl. 8, fig. 1. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Sage Creek, Nebr.

— nebrascensis var. sagensis — Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 172. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo and Valdez inlet, Sucia islands.

— ? obliquus n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 47, pl. 7, figs. 2, 2a. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genesee valley, Plumas county, Cal.

— oblongus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 181. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Vicinity of Morrison, Colo.

— oblongus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.

— oblongus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 285, 286, pl. 2, figs. 1, a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fifteen miles west of Greeley, and six miles south of Fort Collins, Colo.

Inoceramus—Continued.**— peculiaris n. s. Conrad. (1869.)**

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 43, pl. 1, fig. 13. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Crosswicks, N. J.

— peculiaris Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 76. Phila., 1871. T. A. Conrad.
Formation: Cretaceous.

— perovalis n. s. Conrad. (1852.)

Proc. Acad. Nat. Sci., Phila., vol. 6, 1852, 1853, p. 200. Phila., 1854. T. A. Conrad.
Formation: Cretaceous.
Location: Chesapeake & Delaware canal.

— perovalis Conrad. (1854.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 299, pl. 27, fig. 7. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Chesapeake & Delaware canal.

— perovalis (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 80, pl. 15, figs. 6. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: New Jersey (?)

— perplexus n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur., Rocky Mt. region. Prelim. Rep. Paleont., Black Hills, p. 31. Wash., 1877. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Belle Fourche, about ten miles west of Crow peak, Black hills, Dak.

— perplexus Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 392, pl. 8, fig. 3, and pl. 10, figs. 4, 5. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Belle Fourche about ten miles west of Crow peak, Black hills, Dak.

— pertenius n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 276, 277. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.

— pertentuis (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 205, 206. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Sage creek, Colo.

— piochii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 187, 188, pl. 25, figs. 173, 174. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North side of Mount Diablo, Tuscan springs, Cal.

— porrectus n. s. Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 191, 192, Taf. 19, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Entrance to Tukusitnu bay, Alaska.

Inoceramus—Continued.**— problematicus (Schlot.) Meek. (1860.)**

Rep. Expl. Great Basin Terr., Utah, pp. 358, 359, pl. 4, figs. 1a, b, c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

Location: Bear river, near the mouth of Sulphur creek, Wyo.

— problematicus (d'Orb) Newberry. (1861.)

Rep. Colorado river of the West, pt. 3, p. 119. Wash., 1861. J. S. Newberry.

Formation: Cretaceous.

Location: At the crossing of Red fork of the Canadian, on the Santa Fe road.

— problematicus (Schlot. op.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 177, 178, pl. 16, fig. 3a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah, and also upon the west fork of Paria creek, Utah.

— problematicus (Schlot. ?) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 143, 144, pl. 13, figs. 2, 2a. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river, Wyo.

— problematicus (Schlot.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear creek, near Morrison, Colo.

— problematicus (Schlot.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— problematicus ? (Schlot.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 389, 390, pl. 7, fig. 11. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek, Black hills.

— problematicus (Schlot.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 193, 194. Montreal, 1884.

J. F. Whiteaves.

Formation: Cretaceous.

Location: Skidegate inlet, shore between Slate Chuck brook and Lina island; point north of Lina island in Bear Skin bay; Graham island, near Cowgitz.

Inoceramus—Continued.**— problematicus (Schlot.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 85. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Mill creek, at mill west of Fort McLeod, Canada.

— problematicus ? (Schlot.) Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 9. Austin, 1889. R. T. Hill.

Formation: Cretaceous.

Location: Near Austin, Tex.

— problematicus (Schlot.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can., Paleont., vol. 1, pt. 2, pp. 187, 188. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Swan river and Thunder hill; Vermilion river, Riding mountain, section 7, township 24, range 20 west; Ochre river, township 22, range 17 west; Edwards creek, township 23, range 19 west; Vermilion river, township 25, range 20 west; Wilson river, township 25, range 21 west; Valley river, township 25, range 21 west, range 22 west in the same township; Rolling river two miles above the old C. P. R. crossing; Thunder hill, township 35, range 30, west. Manitoba.

— pro-obliquus n. s. Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 80, 81, pl. 14, fig. 17. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, N. J.

— pseudomytiloides n. s. Schiel. (1855.)

Rep. Expl. and Sur. P. R. R. Mississippi river to Pacific ocean, vol. 2; Rep. Expl. Forty-first Parallel, N. lat., p. 108, pl. 3, fig. 8. Wash., 1855. James Schiel.

Formation: Cretaceous.

Location: West of Fort Atkinson.

— quatsinoensis n. s. Whiteaves. (1882.)

Proc. and Trans. Roy. Soc. Can., vol. 1, sec. 4, p. 84, fig. 3. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: Forward inlet, Quatsino sound, Canada.

— (?) rectangulus n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 47, 48, pl. 7, figs. 1-1a. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

— sagensis n. s. Owen. (1852.)

Rep. Geol. Sur. Wis., Iowa, Minn., p. 582, pl. 8, fig. 3. Phila., 1852. D. D. Owen.

Formation: Cretaceous.

Location: Sage creek, southern tributary of the Cheyenne.

Inoceramus—Continued.

- **sagensis** (Owen) Marcou. (1853.)
Geol. Map. of the U. S. and British Provinces of N. A., pp. 46, 47, pl. 7, fig. 6. Boston, 1853. Jules Marcou.
Formation: Cretaceous.
Location: Sage creek, Nebr.
- **sagensis** (Owen) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 393, 395, pl. 7, fig. 12; pl. 8, fig. 2. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek; also at the top of the gray shales at the mouth of Rapid creek, Black hills.
- **sagensis** (Owen) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 76, 78, pl. 14, fig. 15; pl. 15, figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel; New Egypt; Freehold; Keyport, N. J.
- **sagensis** var. **nebrascensis** (Owen) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 34. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: St. Mary river, about ten miles from its mouth; South Saskatchewan, opposite Swift Current creek, Canada.
- **sagensis** var. **nebrascensis** (Owen) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 174. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Mouth of Vermillion river, township 54, range 3, west of the fourth principal meridian; North Saskatchewan river, township 54, range 2, west of the fourth principal meridian; Nose creek, section 24, township 44, range 2, west of the fourth principal meridian, Northwest Territory.
- **sagensis** var. **quadrans** n. var. Whitfield. (1884.)
Mong. U. S. Geol. Sur., vol. 9, p. 79, pl. 14, fig. 16. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near Burlington, N. J.
- **senseni** n. s. Conrad. (1852.)
Proc. Acad. Nat. Sci., Phila., vol. 6, 1852, 1853, p. 200. Phila., 1854. T. A. Conrad.
Formation: Cretaceous.
Location: Missouri river, Nebr.
- **simpsoni** n. s. Meek. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 312. Phila., 1861. F. B. Meek.
Formation: Cretaceous.
Location: North Platte, above the bridge, Nebr.
- **simpsoni** Meek. (1876.)
Rep. Expl. Great Basin Terr., Utah, p. 360, pl. 4, fig. 4. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: North Platte, above the bridge.

Inoceramus—Continued.

- **simpsoni** Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 142, 143, pl. 13, fig. 3. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: North Platte river, above Platte bridge, in Dakota.
- **simpsoni** (Meek) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 395, 396, pl. 8, fig. 1. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: Old Womans fork; east fork of Beaver creek, three miles west of Camp Jenney, Black hills.
- **striatus** (Mantell) Roemer. (1849.)
Tex., p. 402. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall, near New Braunfels, Tex.
- **striatus** (Mantell) Roemer. (1852.)
Kreide von Tex., p. 60. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe, below New Braunfels, Tex.
- **subcompressus** n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 181. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.
- **sublævis** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 386, pl. 2, fig. 1a, b. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **sublævis** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 393, pl. 10, figs. 1-3. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: At the forks of the Cheyenne; and about three miles east of Camp Jenney, Red-water valley, Black hills.
- **subundatus** n. s. Meek. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 315. Phila., 1862. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, eastern shore of Vancouver island.
- **subquadratus** n. s. Schlüter. (1887.)
Verhandl. Naturhist. Vereines, preuss. Rheinlandhr, 44 Johrg. 1 Hälfte. Bonn, 1887. Sitzungsab., pp. 43-44. C. Schlüter.
Formation: Cretaceous.
Location: Near Austin, Tex.
- **tenuilineatus** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 387, pl. 2, figs. 3a, b. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Sage creek and Great bend of the Missouri.

Inoceramus—Continued.**—tenuilineatus (H. & M.) Whitfield. (1880.)**

Rep. Geol. Black Hills of Dak., pp. 400, 401, pl. 9, figs. 12, 13. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.

—tenuilineatus (H. & M.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 34, pl. 5, figs. 1, 1a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Blood Indian creek, longitude 110° W., also elbow of the South Saskatchewan river, Canada.

—tenuirostratus n. s. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, p. 27. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the Missouri river.

—texanus n. s. Conrad. (1854.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 152, pl. 5, fig. 7. T. A. Conrad.

Formation: Cretaceous.

Location: Western Texas.

—tippanus (Con. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 312. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

—umbonatus n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, p. 50. Phila., 1859. Meek & Hayden.

Formation: Cretaceous.

Location: Near Fort Benton, on the Upper Missouri.

—undabundus n. s. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, p. 26. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the Missouri river.

—undabundus (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 84. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Highwood river, ten miles west of the first fork; northwest branch of north fork of the Old Man river, about four miles below the mouth of Oyster creek, Canada.

—undulato-plicatus n. s. Roemer. (1849.)

Tex., p. 402. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

—undulato-plicatus Roemer. (1852.)

Kreide von Tex., p. 59, Taf. 7, fig. 1. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

Inoceramus—Continued.**—undulato-plicatus (Roemer) Whiteaves. (1879.)**

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 168, 169, pl. 20, figs. 2, 2a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo and Valdez inlet, Sable river, Vancouver island; Blunden point and Northwest bay, Vancouver island.

—vancouverensis n. s. Shumard. (1858.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 122, 123. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island.

—vancouverensis (Shum.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 170-172, pl. 20, figs. 4, 4a, b. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, two miles and a quarter up; Protection and Satuma islands; Vesuvius bay, on Salt spring or Admiralty island; Sucia islands.

—vancouverensis (Shumard) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, pp. 37, 38. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

—vanuxemi n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 180. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: White river, above the Bad lands, Nebr.

—vanuxemi (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 181. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Fossil ridge, Colo.

—vanuxemi (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 396-398, pl. 7, figs. 8, 9; pl. 8, figs. 4, 5. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek; on Old Woman fork, and at top of gray shales, near mouth of Rapid creek, Black hills.

—vanuxemi (M. & H. ?) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 185. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

Inoceramus—Continued.**—vanuxemi (M. & H.) Whiteaves. (1889.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 175. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Mouth of Vermilion river, township 54, range 3, west of the fourth principal meridian; North Saskatchewan river, township 54, range 2, west of the same meridian, Northwest Territory.

—vanuxemi var. ? Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 398, pl. 7, fig. 10. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.

—ventricosus n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 87. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

—whitneyi n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 193, 194, pl. 32, fig. 91. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near Folsom, Cal.

—(Actinoceramus) sulcatus (Park.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 241, 242, pl. 32, figs. 3, 3a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: At and around Bear Skin bay, on Graham island, side of Skidegate inlet.

—[Aucella] piochii (Gabb) White. (1888.)

Mong. U. S. Geol. Sur., vol. 13, pp. 226-232, pl. 4, figs. 1, 2. Wash., 1888. C. A. White.

Formation: Cretaceous.

—(Catillus) balchii (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 56, pl. 15, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth; Deer creek, a tributary of the North Platte.

—(Catillus) convexus (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 51, 52, pl. 12, figs. 5a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri, below Fort Pierre.

—(Catillus) cripisii var. subcompressus (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 48, 49, pl. 38, fig. 2, bis. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, above Fort Union.

Inoceramus—Continued.**—(Catillus) cripisii var. barabini (Mort.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 49-51, pl. 13, figs. 1a-c, pl. 12, fig. 3. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth, in Montana.

—(Catillus) incurvus (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 61, pl. 12, figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Little Bear's village, between Fort Pierre and Fort Clark.

—(Catillus) pertenuis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 47, 48, pl. 37, figs. 3a, b, pl. 38, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, above Fort Union.

—(Catillus) proximus (Tuomey) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 53-55, pl. 12, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri, below Fort Pierre.

—(Catillus) proximus ? var. subcircularis n. var. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 55, 56, pl. 12, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth; Deer creek, a tributary of the North Platte.

—(Catillus) sublævis (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 58, 59, pl. 12, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri, below Fort Pierre.

—(Catillus) tenuilineatus (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 57, pl. 12, fig. 6. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri; Sage creek.

—(Catillus) tenuirostris (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 59, fig. 5. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Chippewa point, Mont.

—(Catillus) undabundus (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 60, 61, pl. 3, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Chippewa point on the Missouri, near Fort Benton.

Inoceramus—Continued.— (**Catillus**) **vanuxemi** (M. & H.)
Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 57, 58, pl. 14, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri; Sage creek.

— (**Inoceramus**) **altus** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 43, 44, pl. 14, figs. 1a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near Medicine Bow station, Wyo.

— (**Inoceramus**) **fragilis** (H. & M.)
Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 42, 43, pl. 5, fig. 5, figs. 1, 2, p. 42. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the mouth of Vermilion river, on the Missouri; near Fort Benton, Mont.

— (**Mytiloides**) **problematicus**
(Schlot.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 62, pl. 9, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Big Sioux river, six miles above its mouth; on Little Blue river, near Kansas and Nebraska line, and at many other localities in that region; also at Coalville, Utah, Fort Harker, Mont., as well as in Wyoming, Colorado, Arkansas, and southward into Texas.

— (**Mytiloides**) **problematicus** var.
aviculoides (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 63, 64, pl. 9, fig. 4. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Little Blue river, near the Kansas and Nebraska line; near Big Blue river in Nebraska; on Republican river, Kans.

— (**Volviceramus**) **exogyroides** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 46, 47, pl. 5, figs. 3a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton.

— (**Volviceramus**) **umbonatus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 44-46, pl. 3, figs. 1a, b, pl. 4, figs. 1a, b, and 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twenty miles below Fort Benton, on the Upper Missouri.

— ? Hall. (1845.)

Rep. Expl. Exped. Rocky Mts., Oreg., and North Cal., Fremont, pp. 309, 310, pl. 4, figs. 1, 1a. Wash., 1845. James Hall.

Formation: Cretaceous.

Location: Smoky hill river, long. 98°, lat. 38°.

— ? Hall. (1845.)

Rep. Expl. Exped. Rocky Mts., Oreg., and North Cal., Fremont, p. 310, pl. 4, fig. 2. Wash., 1845. James Hall.

Formation: Cretaceous.

Location: Near the eastern slope of the Rocky mountains, in long. 105°, lat. 39°.

Inoceramus—Continued.

— sp. undet. Bailey.

Rep. Lieut. J. W. Abert, Exam. N. Mex., 1846 and 1847, Ex. Doc. No. 41, p. 547, [pl. 2], fig. 1. [No imprint.] J. W. Bailey.

Formation: Cretaceous.

Location: Rio Timpa, lat. 37° 41', long. 104° 07'.

— sp. undet. Schiel. (1854.)

Rep. Expl. and Sur. P. R. R., Mississippi river to Pacific ocean, vol. 2; Rep. Expl. Forty-first Parallel N. Lat., p. 108, pl. 2, fig. 6. Wash., 1855. James Schiel.

Formation: Cretaceous.

Location: Near Fort Atkinson.

— sp. undet. Owen. (1860.)

Second Rep. Geol. Rec. Ark., pl. 7, fig. 1. Phila., 1860. D. D. Owen.

Formation: Cretaceous.

Location: Arkansas.

— sp. undet. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Between Denver and Cheyenne.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Six miles east of Como station, U. P. R. R. [Wyo.].

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Medicine Bow station [Wyo.].

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Miser station, U. P. R. R. [Wyo.].

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Fountain creek, Colorado city, Colo.

— sp. undet. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Fountain creek, Colorado city, Colo.

— sp. undet. Meek. (1870.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 144, pl. 13, figs. 4, 4a. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: On Sulphur creek, near Bear river, Wyo.

— sp. undet. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two and one-quarter and two and one-half miles up.

Inoceramus—Continued.— **sp. undet. Whiteaves. (1874.)**

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 262.

Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, ten miles up.

— **sp. Whiteaves. (1874.)**

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 261.

Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— **sp. undet. Whiteaves. (1874.)**

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 264.

Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Protection island.

— **(?) Meek. (1876.)**

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 359, pl. 1, fig. 6. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **(?) Whiteaves. (1878.)**

Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 152.

Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Falls of the Iltasyouco river, British Columbia.

— **(?) Whiteaves. (1878.)**

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 403.

Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Falls of the Iltasyouco river.

— **(?) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.

Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **sp. undet. Ramirez. (1880.)**

An. Min. Fomento Rep., Mex., Tomo 3, p. 656,

Lam. 1, fig. 3. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojada, Mexico.

— **Whiteaves. (1889.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 167. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devils lake, Northwest Territory.

Inoperna n. g. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1876. W.

C. Kerr. App. A, p. 5. T. A. Conrad.

— **carolinensis n. s. Conrad. (1875.)**

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W.

C. Kerr. App. A, p. 5, pl. 1, fig. 22. T. A.

Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Irihea (subgen. Swain) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Isocardia (Lam.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 393. Phila., 1858-1860. W. M. Gabb.

— **conradi n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 393, pl. 68, fig. 21. Phila., 1858-1860.

W. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluff, Ala., and Timber creek, N. J.

— **conradi (Gabb) Whitfield. (1885.)**

Mong. U. S. Geol. Sur., vol. 9, pp. 200, 201, pl. 26, figs. 3, 4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Timber creek, N. J. ?

— **? hodgei n. s. Meek. (1871.)**

Proc. Acad. Nat. Sci., Phila., for 1871, pp. 183, 184. Phila., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Band of iron ore that extends along the Upper Missouri for some distance, near the Great bend.

— **washita n. s. Marcou. (1858.)**

Geol. N. Am., p. 37, pl. 3, figs. 2, 2a, b. Zurich, 1858. Jules Marcou.

Formation: Cretaceous.

Location: Borders of Red river, near Preston, Tex.

— **sp. undet. Roemer. 1849.**

Tex., p. 405. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **sp. undet. Roemer. (1852.)**

Kreide von Tex., p. 50. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **sp. undet. Roemer. (1852.)**

Kreide von Tex., p. 50. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Isopleura n. g. Meek. (1864.)

Check List Invert. Foss. N. Am., Cret. and Jur.

Smithson. Misc. Coll., vol. 7, No. 177, p. 36.

Wash., 1864. F. B. Meek.

— **curvilirata Meek. (1864.)**

Check List Invert. Foss. N. Am., Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 36.

Wash., 1864.

Formation: Cretaceous.

Location: Mississippi.

— **curvilirata (Conrad.) Gabb. (1868.)**

Am. Jour. Conch., vol. 4, p. 142, pl. 13, fig. 7.

Phila., 1868. W. M. Gabb.

Formation: Cretaceous.

Janira (Schum.) Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol., 1856-1860, p. 607.

St. Louis, 1856-1860. B. F. Shumard.

Janira—Continued.

- **foveolata** n. s. Eichwald. (1871.)
Geognost. Paleont. Bemerk. Halb. Mang. aleut-
chen Inseln, pp. 197-199, Taf. 20, figs. 6-8. St.
Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaskan peninsula.

- **wrightii** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
607. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Shoal creek, near Austin, Tex.

- Kellia** (Turton) Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 280. Phila., 1858-1860. T. A. Conrad.

- **cretacea** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 280, pl. 46, fig. 19. Phila., 1858-1860.
T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula, Ala.

- Lævicardium** (subgen. Swains.) Conrad.
(1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 326. Phila., 1855-1858. T. A. Conrad.

- **sucieuse** n. s. Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 154,
155, pl. 18, fig. 2, Montreal, 1879. J. F. Whit-
eaves.
Formation: Cretaceous.
Location: Sucia islands.

- Lagena** (subgen. H. & A. Ad.) Gabb.
(1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 281.
Phila., 1876. W. M. Gabb.

- Lampsilis** (subgen. Raf.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash.,
1876. F. B. Meek.

- Lanieria lanieri** (d'Orb.) Cotteau.
(1890.)
Bull. Soc. Geol. France, 3d ser., vol. 18, pp. 298,
299. Paris, 1890. Cotteau.
Formation: Cretaceous.
Location: San Luis, Mexico.

- **lanieri** (d'Orb.) (Duncan) Cotteau.
(1890.)
Bull. Soc. Geol. France, 3d ser., vol. 18, No. 4,
pp. 298, 299. Paris, 1880. Cotteau.
Formation: Cretaceous.
Location: San Luis.

- Latiarca** Conrad. (1875.)
Rep. Geol. Sur., N. C. vol. 1, Raleigh, 1875. W.
C. Kerr. App. A, p. 28. T. A. Conrad.

- (subgen. Conrad) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 84. Wash.,
1876. F. B. Meek.

- Laxispira** n. g. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 301.
Phila., 1876. W. M. Gabb.

Laxispira—Continued.

- **lumbricalis** n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 301,
302, pl. 17, figs. 6 and 7. Phila., 1876. W. M.
Gabb.
Formation: Cretaceous.
Location: Haddonfield, N. J.

- Leda** (Schum.) Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat.
Expl. Exped., H. Y. Hind, p. 183. Toronto,
1859. F. B. Meek.

- **angulata** n. s. Gabb. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 95.
Phila., 1861. W. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, N. J.

- **bisulcata** n. s. M. & H. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 440.
Phila., 1862. Meek & Hayden.
Formation: Cretaceous.
Location: Deer Creek, near north branch Platte
river, Nebr.

- **evansi** (M. & H.) Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat.
Expl. Exped., H. Y. Hind, p. 184. Toronto,
1859. F. B. Meek.
Formation: Cretaceous.
Location: South branch of the Saskatchewan,
Canada.

- **fibrosa** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp.
39, 40. St. Louis, 1856-1860. Evans & Shu-
mard.
Formation: Cretaceous.
Location: Sage creek, Nebr. terr.

- **gabbii** (Con. sp.) Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 197, 198.
Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: California.

- **hindi** n. s. Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat.
Expl. Exped., H. Y. Hind, p. 183, pl. 1, figs. 8,
9. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: Little Souris river, Canada.

- **longifrons** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, pp. 281, 282, pl. 46, fig. 18. Phila., 1858-
1860. T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula, Ala.

- **pinnaforma** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 303, pl. 48, fig. 23. Phila., 1858-1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Burlington, county, N. J.

- **protecta** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 303, pl. 48, fig. 24. Phila., 1858-1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Burlington and Gloucester counties,
N. J.

Leda—Continued.— **protecta** Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858–1860, p. 397, pl. 68, fig. 35. Phila., 1858–1860.
W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tenn.

— **protecta** ? Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 199, pl. 26, fig. 185. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: From Clayton to Marsh's, Martinez, San Diego, Alizos creek, near Canada de las Uvas, and in the San Emidio canyon, near the same place, Cal.

— **slackiana** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858–1860, p. 397, pl. 69, fig. 36. Phila., 1858–1870.
W. M. Gabb.

Formation: Cretaceous.

Location: Crosswicks, N. J.

Legumen n. g. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855–1858, p. 325. Phila., 1855–1858. T. A. Conrad.

— **appressum** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 185, 186, pl. 25, figs. 6–8. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **appressus** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855–1858, p. 325. Phila., 1855–1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **ellipticus** n. s. Conrad. (1858)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1852–1858, p. 325, pl. 34, fig. 19. Phila., 1855–1858.
T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **planulatum** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 184, 185, pl. 25, figs. 3, 4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold, and from the marl pits of G. C. Schancks, Monmouth county, N. J.

— **planulatus** Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858–1860, p. 277. Phila., 1858–1860. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama and New Jersey.

— **planulatus** (Con. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 304, 305. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Leioderma (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 292.
Phila., 1876. W. M. Gabb.

— **canalis** (Conn. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 292.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Clay county, Ga.

Leiopistha (Meek) White. (1874.)

Prelim. Rep. Invert. Foss., Geogr. and Geol. Expl. and Sur., west of one hundredth meridian, p. 26. Wash., 1874. C. A. White.

— **elegantula** (Roem.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 141, 142.
Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey. ?

— **inflata** n. s. Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 142, pl. 20, figs. 4, 5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, N. J.

— **protecta** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 140, 141, pl. 20, figs. 1–3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Burlington, N. J.

— (**Cymella**) **meeki** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 418, 419, pl. 11, figs. 27, 28. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Deadmans rapids, Upper Missouri.

— (**Cymella**) **undata** (M. & H. sp.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, p. 187, pl. 18, fig. 15a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Gallinas creek, N. Mex.

— (**Psilomya**) **meekii** n. s. White. (1874.)

Prelim. Rep. Invert. Foss., Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, p. 26. Wash., 1874. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

— (**Psilomya**) **meekii** White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 186, 187, pl. 18, figs. 14a–d. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

Leioplax (Troschel) White. (1876.)

Rep. Geol. Uinta Mts., p. 133. Wash., 1876. C. A. White.

— ? **turricula** n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 133, 134. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

Leptaena n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 307, 308. Phila., 1858-1860. W. M. Gabb.

Formation: Triassic?

Location: Bath county, Va.

Leptesthes subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 523. Wash., 1876. F. B. Meek.

Leptocardia subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 172. Wash., 1876. F. B. Meek.

Leptomya n. g. Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 15. Phila., 1867. T. A. Conrad.

— applicata Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 15. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

Leptosolen n. subgen. Con. (1865.)

Proc. Acad. Nat. Sci., Phila., for 1865, p. 184. Phila., 1865. T. A. Conrad.

— n. g. Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 15. Phila., 1867. T. A. Conrad.

— biplicata Con. (1867.)

Am. Jour. Conch., vol. 3, pp. 15, 16. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

Location: North Mississippi.

— biplicata (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 304. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Clay county, Ga.

— biplicata (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 183, 184, pl. 25, figs. 1, 2. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schancks, near Marlboro, N. J.

— conradi n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 311, 312. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— conradi Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 253, 254, pl. 2, figs. 12a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

Lima [Brug.] Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 151. Wash., 1857. T. A. Conrad.

— appressa n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 203, pl. 31, fig. 271. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: San Luis, Gonzaga ranch, Cal.

Lima—Continued.**— crenulicosta n. s. Roemer. (1849.)**

Tex., p. 399. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— crenulicosta Roemer. (1852.)

Kreide von Tex., p. 63, Taf. 8, figs. 8a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

— ? cuneata n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 44, 45, pl. 7, figs. 6, 6a. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

— duplicata (Sow.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 402. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake.

— duplicata (Sow. sp.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 152. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake, British Columbia.

— erringtoni n. s. Gabb. (1864.)

Proc. Cal. Acad. Nat. Sci., vol. 3, p. 173. San Francisco, 1863-1868. W. M. Gabb.

Formation: Jurassic [Cretaceous?].

Location: Mariposa estate, Mariposa county, Cal.

— glabra n. s. Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 196, Taf. 16, figs. 25, 26. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— kimballi n. s. Gabb. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 264, 265, pl. 11, fig. 1. Phila., 1872. W. M. Gabb.

Formation: Cretaceous.

Location: Nugal, near the center of the state of Chihuahua, Mexico.

— leonensis n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 151, pl. 5, figs. 3a-c. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon springs [Tex.].

— microtis n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 202, pl. 26, fig. 189. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— multiradiata n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 201, 202, pl. 33, fig. 101. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Vicinity of lower lake village, Lake county, Cal.

Lima—Continued.**— multiradiata ? (Gabb) Whiteaves. (1879.)**

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 174.

Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Entrance to Departure bay.

— perobliqua n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 165, pl. 22, figs. 3, 3a.

Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rock mountains, three miles north of the east end of Devils lake, Northwest Territory.

— punctum n. s. Eichwald. (1871.)

Geog. Paleont. Bemer. Halb. Mang. aleutischen, Inseln, p. 197, Taf. 16, figs. 23, 24. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— recticostata n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 44, pl. 7, fig. 5. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

— reticulata n. s. Forbes. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, p. 62, figs. —, p. 62. London, 1845. Edward Forbes.

Formation: Cretaceous.

Location: New Jersey.

— shastaensis n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 201, pl. 33, fig. 100. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

— ? sinuata n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 43, pl. 7, figs. 4, 4a. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

— wacoensis n. s. Roemer. (1849.)

Tex., pp. 399, 400. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: [Waco camp, near New Braunfels] Tex.

— wacoensis Roemer. (1852.)

Kreide von Tex., pp. 63, 64, Taf. 8, figs. 7a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, on the Guadalupe, above New Braunfels, Tex.

— wacoensis (Roem.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 151, pl. 5, figs. 4a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: [Texas.]

— wacoensis (Roem.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 176, 177, pl. 17, figs. 4a-c. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

Lima—Continued.**— (Limatula) erecta n. s. Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 130, pl. 12, fig. 2. Wash., 1877. F. B. Meek.

Formation: Jurassic.

Location: New Pass, Desatoya mountains, Nev.

— (Plagiostoma) occidentalis n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 292, 293, pl. 7, fig. 23. Wash., 1867. Hall & Whitfield.

Formation: Jurassic.

Location: Flaming gorge, Uinta range, Utah.

— (Plagiostoma) sp. undet. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 15. Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Mormon station, Plumas county, Cal.

— sp. undet. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 251. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

Limnæa (Lam.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 531-533. Wash., 1876. F. B. Meek.

— (Lam. typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 532. Wash., 1876. F. B. Meek.

— ? accelerata n. s. White. (1886.)

Bull. U. S. Geol. Sur., No. 29, pp. 20, 21, pl. 4, figs. 12-15. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Eight miles north of Canyon city, Colo.

— ativuncula n. s. White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 20, pl. 4, figs. 10, 11. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Eight miles north of Canyon city, Colo.

— ? compactilis (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 39, pl. 26, fig. 14. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Separation station, southern Wyoming.

— consortis n. s. White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 20, pl. 4, figs. 8, 9. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Eight miles north of Canyon city, Colo.

Limnæa nitidula Meek. (1876.)

Rep. Expl. Great Basin Terr., Utah, pp. 363, 364, pl. 5, fig. 14. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Mouth of Sulphur creek, Wyo.

— nitidula (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Mellis station, Wyo.

Limnæa—Continued.

- **nitidula** (Meek) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 84. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near mouth of Sulphur creek, Wyo.
- **tenuicostata** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 13. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Mouth of the Blind Man river, township 39, range, 27, west of fourth principal meridian, Canada.
- (**Acella**) **haldemani** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 39, pl. 6, figs. 18, 19. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming.
- (**Limnophysa** ?) **compactilis** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 517. Wash., 1873. F. B. Meek.
Formation: Tertiary [Cretaceous].
Location: Separation on the Union Pacific railroad [Wyo.].
- (**Limnophysa**) **nitidula** Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 181, 182, pl. 17, figs. 5, 5a. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Sulphur creek, on Bear river, Wyo.
- (**Limnophysa**) **nitidula** (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 39, pl. 6, figs. 15, 16. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming.
- (**Pleurolimnæa**) **tenuicostata** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 534, pl. 44, figs. 13a-c. Wash., 1876. F. B. Meek.
Formation: Tertiary. [Cretaceous].
Location: Three miles below Fort Union.
- (**Pleurolimnæa**) **tenuicostata** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Part 1, p. 84. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Fort Union, in the Upper Missouri river region.
- **tenuicostata** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 119. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union.
- (**Pleurolimnæa**) **tenuicostata** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 39, pl. 23, fig. 24. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: [Near Fort Union.]

Limnophysa (subgen. Fitzinger) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 533. Wash., 1876. F. B. Meek.

Limopsis (Sassi) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 200. Phila., 1864. W. M. Gabb.

— **parvula** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 97, 98, pl. 28, figs. 17a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth.

— **striata-punctatus** n. s. E. & S. (1857.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 38. St. Louis, 1856-1860. Evans & Shumard.

Formation: Cretaceous.

Location: Moreau and Grand rivers, Nebr.

— **transversa** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 200, pl. 26, fig. 186. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

Linearia n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 279. Phila., 1858-1860. T. A. Conrad.

— **contracta** n. s. Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, p. 167, pl. 23, fig. 5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, N. J.

— ? **formosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 199, 200, pl. 30, fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twenty miles below the mouth of Cannon ball river.

— **formosa** ? (M. & H.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 177, pl. 24, fig. 3. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sounding creek, township 30, range 8, west of the fourth principal meridian, Northwest Territory.

— **metastriata** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 279, 280, pl. 46, fig. 7. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **metastriata** (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 165, 166, pl. 23, figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Haddonfield, N. J.

Linearia—Continued.

- **suciensis** n. s. Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 146, 147, pl. 17, fig. 12. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

- (**Leiothyris**) **meekana** Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 147. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

- (**Liothyris**) **carolinensis** Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 9, pl. 1, fig. 26.

T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

- Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, pp. 73, 74, pl. 3, fig. 11. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

Lingula (Brug.) M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 443. Phila., 1862. Meek & Hayden.

- **brevirostris** n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, p. 50. Phila., 1859. Meek & Hayden.

Formation: Jurassic.

Location: Western and southwestern base of Black hills.

- **brevirostris** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 69, pl. 3, figs. 3, a, b. Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills, Idaho Territory.

- **brevirostris** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 246, 247, pl. 3, figs. 4, 5. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: On the east side of Spearfish creek, near its junction with the Redwater, Black hills, Dak.

- **nitida** n. s. M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 443, 444. Phila., 1862. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth Big Horn river, Nebr.

- **nitida** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 9, 10, pl. 28, figs. 18a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of the Big Horn river.

- **nitida** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 205. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colo.

Lingula—Continued.

- **nitida** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 29. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Three miles north of Ross coulee, near Irvine station, on the Canadian Pacific railway, Old Wives creek, Township 10, Range 11, west of third principal meridian, Canada.

- **subspatulata** n. s. (H. & M.) (1854.)

Mem. Am. Acad. Arts and Sci., n. s., vol. 5, p. 380, pl. 1, figs. 2a, b. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Near Red Cedar island, thirty-five miles below Fort Pierre.

- **subspatulata** (H. & M.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

- **subspatulata** (H. & M.) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, p. 169, pl. 15, fig. 4a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Ten miles southeast of Old Fort Wingate, N. Mex.

- **subspatulata** ? (H. & M.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 185, 186. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rolling river, township 35, range 26, Manitoba.

Liocium n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 174. Phila., 1869. W. M. Gabb.

- **punctatum** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 173, pl. 28, fig. 59. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: South of the road from Colusa to the Hot Sulphur springs in the first range of foot hills, Colusa county, Cal.

Lioderma n. g. Con. (1865.)

Proc. Acad. Nat. Sci., Phila., for 1865, p. 184. Phila., 1865. T. A. Conrad.

- **lioderma** (Con. sp.) Con. (1865.)

Proc. Acad. Nat. Sci., Phila., for 1865, p. 184. Phila., 1865. T. A. Conrad.

Formation: [Cretaceous.]

- **thoracica** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1, Raleigh, 1875, W. C. Kerr. App. A, p. 13, pl. 2, fig. 30. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Liopeplum n. g. Dall. (1890.)

Trans. Wag. Free Inst. Sci., Phila., vol. 3, p. 73.
Phila., 1890. W. H. Dall.

— **spillmani** (Tuomey sp.) Dall. (1890.)

Trans. Wag. Free Inst. Sci., Phila., vol. 3, pp. 82,
83, pl. 6, fig. 12. Phila., 1890. W. H. Dall.
Formation: Cretaceous.
Location: Tippah county, Miss.

— **subjugosum** (Gabb sp.) Dall. (1890.)

Trans. Wag. Free Inst. Sci., Phila., vol. 3, p. 83,
pl. 6, fig. 12a. Phila., 1890. W. H. Dall.
Formation: Cretaceous.
Location: Tippah county, Miss.

Liopistha n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, pp. 32, 33.
Wash., 1864. F. B. Meek.

— (Meek) White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur.,
west of one-hundredth meridian, G. M. Wheeler,
p. 26. Wash., 1874. C. A. White.

— (Meek, typical.) (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 229. Wash.,
1876. F. B. Meek.

— **? elegantulum** (Roem.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, pp. 32,
33. Wash., 1864. F. B. Meek.
Formation: Cretaceous.
Location: Texas.

— **protexta** Conrad. (1875.)

Rep. Geol. Sur., N. C., vol. 1. Raleigh, 1875.
W. C. Kerr. App. A, p. 28. T. A. Conrad.
Formation: Cretaceous.
Location: Ripley, Miss.

— **protexta** (Con.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 227, figs.
24-24, p. 227. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

— **undata** (M. & H.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 2, p. 178. Montreal, 1889. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Nose creek, township 37, range 9, west
of the fourth principal meridian, Northwest
Territory.

— (**Cymella**) **bella** (Con.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 228, figs. 25-
30, p. 228. Wash., 1876. F. B. Meek.
Formation: Cretaceous.

— (**Cymella**) **meekii** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region,
Prelim. Rep. Paleont. Black Hills, pp. 35, 36.
Wash., 1877. R. P. Whitfield.
Formation: Cretaceous.
Location: Dead Mans rapids, upper Missouri.

Liopistha—Continued.— (**Cymella**) **undata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 236, 237,
pl., 39, figs. 1a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, on the upper
Missouri, in Idaho Terr.

— (**Cymella**) **undata** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, pp. 43, 44. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.

Location: St. Mary river, near its junction with
the Belly river; South Saskatchewan, opposite
mouth of Swift Current creek; Bulls Head,
about twenty-two miles west of the west end of
the Cypress hills; Berry creek, township 25,
range 12, and four miles south of Battle river,
township 38, between ranges 12 and 13, both
west of fourth meridian; three miles north of
Ross coulee, near Irvine station, on the Canadian
Pacific railway, Canada.

— (**Cymella**) **undata** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, p. 80. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Milk river, four miles east of MacLeod
Benton trail, Canada.

— (**Psilomya**) **meekii** n. s. White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur.,
west of one-hundredth meridian, G. M. Wheeler,
p. 26. Wash., 1874. C. A. White.
Formation: Cretaceous.
Location: Southeast of Paria, Utah.

Lioplacodes n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, p. 40.
Wash., 1864. F. B. Meek.

— **veterna** (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, p. 40.
Wash., 1864. F. B. Meek.
Formation: Jurassic.
Location: Idaho.

— **veternus** (Meek) M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, p. 116, fig. 2, text. Wash.,
1865. Meek & Hayden.
Formation: Jurassic.
Location: Head of Wind river, Dak.

— **veternus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 60, pl. 3, fig.
9. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Near Blacks hills.

Lioplacodes—Continued.

- **veterinus** (M. & H.) White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 23, pl. 4, fig. 18.
Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Black hills of Dak.

Liothyris n. subgen. Conrad. (1875.)

- Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W.
C. Kerr. App. A, p. 9. T. A. Conrad.

Liroscapha n. g. Conrad. (1869.)

- Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p.
100. Phila., 1870. T. A. Conrad.

— **squamosa n. s. Conrad. (1869.)**

- Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p.
100, pl. 9, fig. 23. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.

Lispodesthes n. g. White. (1875.)

- Rep. Geogr. and Geol. Expl. and Sur., west of
one-hundredth meridian, vol. 4, pt. 1, p. 191.
Wash., 1875. C. A. White.

— **lingulifera n. s. White. (1875.)**

- Rep. Geogr. and Geol. Expl. and Sur., west of
one-hundredth meridian, vol. 4, pt. 1, pp. 192,
193, pl. 18, figs. 2a, b. Wash., 1875. C. A.
White.
Formation: Cretaceous.
Location: East of Mount Taylor, one mile south
of Pajuate, N. Mex.

— **nuptialis White. (1875.)**

- Rep. Geogr. and Geol. Expl. and Sur., west of
one-hundredth meridian, vol. 4, pt. 1, p. 192, pl.
18, figs. 3a, b. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Fifty miles north of Camp Apache, five
miles west of Mineral spring, Ariz.

— **? obscurata n. s. White. (1883.)**

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pt. 1, pp. 30, 31, pl. 11, figs. 7a, b. Wash.,
1883. C. A. White.
Formation: Cretaceous.
Location: Dodson's ranch, near Pueblo, Colo.

Lithodomus sp. Credner. (1870.)

- Zeitsch. Deutsch. Geol. Ges., Band 22, p. 233.
Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.

— **affinis** (Gabb) Whitfield. (1885.)

- Mong. U. S. Geol. Sur., vol. 9, pp. 66, 67, pl. 17,
figs. 2, 3. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington county, ? N. J.

— **maudensis n. s. Whiteaves. (1884.)**

- Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1,
pt. 3, pp. 237, 238, pl. 32, figs. 6, 6a.
Formation: Cretaceous.
Location: East end of Maud island.

— **maudensis Whiteaves. (1884.)**

- Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1,
pt. 3, p. 250. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Maud island.

Lithodomus—Continued.— **ripleyana** (Gabb) Whitfield. (1885.)

- Mong. U. S. Geol. Sur., vol. 9, pp. 67, 68, pl. 17,
figs. 4, 5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near New Egypt; Mr. Ware's pits near
Mullica hill; and at Hunt's pits at Manalapan,
Monmouth county, N. J.

Lithophaga (Bolt.) Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, p. 311.
Phila., 1876. W. M. Gabb.

— **ripleyana** Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, pp. 311, 312.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.

Lithophagus (Muhlf.) Gabb. (1861.)

- Proc. Acad. Nat. Sci., Phila., for 1861, p. 326.
Phila., 1862. W. M. Gabb.

— **affinis n. s. Gabb. (1861.)**

- Proc. Acad. Nat. Sci., Phila., for 1861, p. 327.
Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, ? N. J.

— **oviformis n. s. Gabb. (1864.)**

- Geol. Sur. Cal. Paleont., vol. 1, p. 185, pl. 25,
fig. 168. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Crow creek, Shasta county, Cal.

— **ripleyanus n. s. Gabb. (1861.)**

- Proc. Acad. Nat. Sci., Phila., for 1861, pp. 326, 327.
Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Point where the West Jersey railroad
crosses Big Timber creek, between Gloucester
and Red bank, N. J.

Littorina (Ferussac) Gabb. (1864.)

- Geol. Sur. Cal. Paleont., vol. 1, p. 131. Phila.,
1864. W. M. Gabb.

— **? compacta n. s. Gabb. (1864.)**

- Geol. Sur. Cal. Paleont., vol. 1, p. 131, pl. 20, fig.
89. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, Placer county, Cal.

— **compacta** (Gabb) Whiteaves. (1879.)

- Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 121.
Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Southwest side of Denman island.

Loricula canadensis n. s. Whiteaves. (1889.)

- Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 2, pp. 190, 191, pl. 26, figs. 4, 4a.
Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: South Duck river, township 34, range
23 west, Manitoba.

Loripes (Poli) Gabb. (1864.)

- Geol. Sur. Cal. Paleont., vol. 1, p. 177. Phila.,
1864. W. M. Gabb.

Loripes—Continued.— **dubia** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 177, pl. 24, figs. 170, 171. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county; Chico creek, Butte county; Tuscan springs, Tehama county, Cal.

— **Loxotrema** n. g. Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 147. Phila., 1868. W. M. Gabb.

— **turrita** n. s. Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 147, pl. 14, fig. 21. Phila., 1868. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— **turrita** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 168, pl. 28, fig. 49. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Ten miles west of Griswold's, between San Juan and New Idria, Cal.

Lucina [Brug.] Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275. Phila., 1850-1854. T. A. Conrad.

— (Brug. typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 130. Wash., 1876. F. B. Meek.

— **acute lineolata** n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, p. 14, Taf. III [xxxiii], figs. 4a, 4b. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **cleburni** n. s. White. (1881.)

Proc. U. S. Nat. Mus., vol. 4, p. 139, pl. 1, figs. 3 and 4. Wash., 1881. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. O. A. White.

Formation: Cretaceous.

Location: Vicinity of Julesburg, Colo.

— **cretacea** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 177, pl. 30, fig. 255. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: From Clayton to Marsh's, vicinity of Mount Diablo, Cal.

— **cretacea** (Con.) Whitfield. (1884.)

Mong. U. S. Geol. Sur., vol. 9, pp. 129, 130, pl. 18, figs. 23-25. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **cumulata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 176, pl. 24, fig. 254. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

— **glebula** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 7, pl. 1, fig. 12. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Lucina—Continued.— **lenticularis** (Goldf.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 235. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Middletown, N. J.

— **nasuta** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 175, pl. 24, fig. 158. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

— **nasuta** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 157. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands; below Dodd narrows, Vancouver island.

— **occidentalis** (Mort. sp. ?) M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 273, 274. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Near Milk river, and eighty miles above on the Missouri; also on the Yellowstone and Moreau rivers, Nebr.

— **occidentalis** (Mort.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 134, 135, pl. 17, figs. 4a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Milk river, and on Cheyenne river; also on Moreau river.

— **occidentalis** (Mort.) Whitfield. (1880.)

Report Geol. Black Hills of Dak., pp. 409, 410, pl. 11, figs. 19-21. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Cheyenne river, near Rapid creek, Black hills.

— **occidentalis** (Morton) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 39. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bull Pound creek, section 3, township 26, range 14, west of fourth principal meridian; Old Wives creek, township 10, range 11, west of fourth principal meridian, Canada.

— **occidentalis** var. **ventricosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 135, 136, pl. 17, figs. 3a, c. Wash., 1876. F. B. Meek.

— **parvilineata** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 204. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Corsicana, Navarro county, Tex.

— **punguis** n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 18. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: New Jersey. (?)

Lucina—Continued.

- **postradiata** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 175, 176, pl. 24, fig. 159. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, Placer county, Cal.
- **profunda** n. s. White. (1880.)
Proc. U. S. Nat. Mus., vol. 3, pp. 158, 159. Wash., 1880. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.
Formation: Cretaceous.
Location: Monument creek, Colo.
- **profunda** White. (1881.)
Proc. U. S. Nat. Mus., vol. 4, p. 138, pl. 1, figs. 5, 6. Wash., 1881. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.
- **richardsonii** n. s. Whiteaves. (1874)
Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 262. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, ten miles up.
- **richardsonii** Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 266, pl. —, fig. 1. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, ten miles up.
- **smockana** n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 130, 131, pl. 18, figs. 21, 22. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Freehold, N. J.
- **subcircularis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 176, pl. 24, fig. 160. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, Placer county, Cal.
- **subcircularis** ? (Gabb) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 157. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands.
- **sublenticularis** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 602. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Bluffs of Red river in Lamar and Fannin counties, Tex.
- **subundata** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 382, pl. 1, figs. 6a, b. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Sage creek.
- **subundata** (H. & M.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, p. 184, pl. 18, fig. 12a. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Southeast of Paria, Utah.

Lucina—Continued.

- **subundata** (H. & M.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 133, 134, pl. 17, figs. 2a-e. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Sage creek, on the Cheyenne.
- **translucida** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 199, 200, pl. 30, fig. 269. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cow creek, Shasta county, Cal.
- **ventricosa** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 410, 411, pl. 11, figs. 14-16. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek.
- **(Diplodonta ?) subundata** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 411, 412, pl. 11, figs. 17, 18. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.
- **sp. undet. Roemer.** (1849.)
Tex., p. 407. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **? sp. undet. Whiteaves.** (1874.)
Geol. Sur. Can., Rep. Prog., for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two and one-quarter and two and one-half miles up.
- **sp. undet. Whiteaves.** (1876.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 61, 62, pl. 9, fig. 12, fig. 6, p. 61. Montreal, 1866. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte island.
- **(?) sp. undet. Whiteaves.** (1876.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 62, 63, fig. 7, p. 62. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte island.
- **? White.** (1878.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- Lunatia** (subgen. Gray) Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 334. Phila., 1855-1858. T. A. Conrad.
- **[Gray] Gabb.** (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 391. Phila., 1858-1860. W. M. Gabb.
- **altispira** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 320. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Crosswicks, N. J.

Lunatia—Continued.

- **avellana** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 105, 106, pl. 19, fig. 60. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, north fork, Cal.
- **carolinensis** n. s. Conrad. (1875.)
Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 13, pl. 2, fig. 29. T. A. Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.
- **concinna** (H. & M.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9. pp. 314, 315, pl. 32, figs. 11a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: On Moreau river, in Dakota.
- **concinna** (H. & M.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 430, pl. 12, fig. 13. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek.
- **concinna** (H. & M.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 48. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Elbow of the South Saskatchewan, also Blood Indian creek, north of the Red Deer river, and twenty miles east of the Hand hills, Canada.
- **concinna** (H. & M. sp.) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 181. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Battle river, township 46, range 3, west of the fourth principal meridian; Sounding creek, township 30, range 8, west of the same meridian, Northwest Territory.
- **halli** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 391, pl. 68, fig. 11. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.
- **hornii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 106, 107, pl. 29, fig. 217. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Alizos creek, near Fort Tejon, Cal.
- **nuciformis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 107, pl. 28, fig. 218. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Alizos creek, near Fort Tejon; near Clayton; San Diego, Cal.

Lunatia—Continued.

- **obtusivolva** (Gabb) Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 45, pl. 1, fig. 11. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
- **occidentalis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 315, 316, pl. 32, figs. 12a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak.
- **pedernalis** (Roem. sp.) Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 259, 260, pl. 35, fig. 3. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **rectilabrum** (Con. sp.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 296. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Common everywhere in the Ripley group.
- **shumardiana** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 106, pl. 19, fig. 61. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Hills southwest of Martinez, Cal.
- **shumardiana** (Gabb) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 45. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia island.
- **subcrassa** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 316, 317, pl. 39, figs. 3, a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, on the Upper Missouri.
- **subcrassa** (M. & H.) White. (1878.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 185. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: On the Cache á la Poudre, Colo.
- **subcrassa** (M. & H.) White. (1878.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- **utahensis** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 122. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Gyrodes?**) **conradiana** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 107, 108, pl. 29, fig. 219. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: On the San Luis Gonzaga ranch, at the east end of Pachecos pass, Cal.

Lunulites [—] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 82. Phila., 1834. S. G. Morton.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 82. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Luponia (subgen. Gray) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 163. Phila., 1869. W. M. Gabb.

Lutraria (Lam.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 154. Phila., 1864. W. M. Gabb.

— **truncata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 154, pl. 22, fig. 128. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, Butte county; Chico creek, Cal.

— ? — Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 67, 68. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Delaware.

Lyonsia [Turton] Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 172. St. Petersburg, 1871. E. Eichwald.

— **alduini** (Fisch.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 172-174, Taf. 15, figs. 1-3. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

Lyosoma n. g. White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 152, 153. Wash., 1883. C. A. White.

— **powelli** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 153, pl. 38, figs. 6a-d. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Mouth of Thistle creek, Spanish fork canyon, Utah.

Lysis n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 138. Phila., 1864. W. M. Gabb.

— **duplicosta** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 138, pl. 21, fig. 98. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— **oppansus** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 17, pl. 4, figs. 14, 15. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Pence's ranch, Butte county, Cal.

Lytoceras batesi (Trask sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 202, 203, pl. 27, fig. 1. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet.

Lytoceras—Continued.— **sacya** (Forbes sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 203, pl. 25. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet; Skidegate inlet; Shingle bay; east side of Shingle point; shore one mile and three-quarters southwest of Welcome point; bay east of Alliford bay.

— **timotheanum** (Mayor sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 203, 204. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South island; Bear Skin bay, Skidegate inlet; north shore of Cumshewa inlet.

Macrocallista (n. subgen. Meek.) (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 179. Wash., 1876. F. B. Meek.

Macrocyclus spatiosa (M. & H.?) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Evanston coal mines, Wyo.

Macrodon — ? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Macroscaphites n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 414. Wash., 1876. F. B. Meek.

Mactra (Linn) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 269. Phila., 1856. T. A. Conrad.

— (Linn, typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 204. Wash., 1876. F. B. Meek.

— **alta** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 271, 271. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Bad lands of Judith river, Nebr.

— **ashburnerii** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 153, pl. 22, fig. 127. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, Butte county; Chico creek; Texas flat, Placer county; near Martinez; Tuscan springs, Tehama county; Orestimba canyon, Stanislaus county; Benicia; San Luis Gonzaga ranch, Pacheco's pass; Martinez; Marsh's, southeast of Mount Diablo; Alizos creek, near Fort Tejon, etc., Cal.

Mactra—Continued.

- **ashburnerii** (Gabb) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 42. Wash., 1889.
C. A. White.
Formation: Cretaceous.
Location: Sucia and Waldron islands.
- ? **cañonensis** n. s. Meek. (1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 308. Wash., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Canyon city, Colo.
- ? **cañonensis** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 297, 298, pl. 9, figs. 11a-c. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Canyon city, Colo.
- ? **emmonsi** n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 153, 154, pl. 15, fig. 8. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: East Canyon creek, Wasatch range, Utah.
- **formosa** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 271. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Near mouth of Judith river, Nebr.
- **gibbsana** Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 374, pl. 2, figs. 8, 8a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous or Tertiary.
Location: Found loose on the Straits of Fuca.
- **gracilis** M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 179. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, one hundred and fifty miles above the mouth, Nebr.
- **holmesi** (Meek sp.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear and Ralston creeks, Colo.
- ? **holmesi** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 295-297, pl. 6, figs. 4a-c. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Ralston [Van Bibber?] creek, three or four miles north of Golden city, Colo.
- ? **incompta** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, p. 185, pl. 17, figs. 6a, b. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Five miles above Pueblo, Colo.
- **maia** n. s. Whitfield. (1876.)
Rep. Rec. Carroll, Mont., to Yellowstone National Park, p. 144. Wash., 1876. R. P. Whitfield.
Formation: Cretaceous.
Location: Near the mouth of the Judith river.

Mactra—Continued.

- ? — **tenuissima** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 179, pl. 29, fig. 68. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- **texana** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 269. Phila., 1856. T. A. Conrad.
Formation: Cretaceous. [Tertiary.]
Location: Between Laredo and Rio Grande city, Tex.
- **texana** Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 148, pl. 4, figs. 1a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous. [Tertiary.]
Location: *Prairie between Laredo and Rio Grande city.
- **warrenana** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 271. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Yankton trading post, Nebr.
- (**Cymbophora**) **alta** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 210, pl. 37, figs. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, on the Missouri, and at several localities west of Greeley.
- (**Cymbophora**) **alta** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 225. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near White river Indian agency, Colo.
- (**Cymbophora**) **alta** (M. & H.) Meek. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 62. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Milk river ridge, Canada.
- (**Cymbophora**) **formosa** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 207, pl. 39, fig. 7. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Idaho Terr.
- (**Cymbophora** ?) **gracilis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 209, pl. 17, figs. 18a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: On the Yellowstone river, Idaho Terr., one hundred and fifty miles above the mouth.
- (**Cymbophora**) **gracilis** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 43. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Eastern branch of the Poplar river, on the forty-ninth parallel, Canada.

* The region mentioned above is occupied by Tertiary rocks; therefore it must be a mistake in labeling, or identification.

Mactra—Continued.— *Cymbophora gracilis* (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 79. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Milk river, at the mouth of Pa-Kow-Ki coulee, Canada.

— (*Cymbophora* ?) *nitidula* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 211, 212, pl. 30, figs. 6a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Deer creek, near the north branch of Platte river.

— (*Cymbophora* ?) *siouxensis* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 206, pl. 1, figs. 7a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On Big Sioux river two miles above its mouth.

— (*Cymbophora* ?) *utahensis* n. s. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 155, 156, pl. 15, figs. 9a, b. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: East canyon creek, Wasatch range, and near Coalville, Utah.

— (*Cymbophora* ?) *warrenana* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 208, pl. 30, figs. 7a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river and Long lake, Dak., near Greeley, Colo.

— (*Cymbophora*) *warrenana* (M. & H.) White. (1878.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of Saint Vrain creek and near Aaron Eaton's farm in the valley of the Cache a la Poudre; also at Fossil ridge, Colo.

— (*Cymbophora*) *warrenana* (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 229. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Dodd's ranch on Ashley's fork, Utah.

— (*Cymbophora* ?) *warrenana* (M. & H.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 142, 143, pl. 17, fig. 9; pl. 19, figs. 3, 3a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; Gabriola island; Blunden point, Vancouver island; Protection and Sucia islands; Newcastle island; two miles and a half up the Nanaimo river, Vancouver island.

BULL. 102—12

Mactra—Continued.— (*Cymbophora*) *warrenana* (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 43. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, five miles above Swift Current creek; Ross coulee, near Irvine station, on the Canadian Pacific railway, Canada.

— (*Trigonella* ?) *arenaria* n. s. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 154, 155, pl. 14, fig. 5. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: On Red creek, Uinta mountains; and on Chalk creek, Utah.

— sp. undet. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog., for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two and a quarter and two and a half miles up.

— (?) sp. undet. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog., for 1873-1874, p. 264. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Protection island.

— sp. undet. Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog., for 1873-1874, p. 265. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

Margarita (Leach) Meek. (1876)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 298. Wash., 1876. F. B. Meek.

— *mudgeana* Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 300, pl. 2, figs. 9a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kan.

— *nebrascensis* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 298, 299, pl. 19, figs. 8a, b, and 9a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth, Long Lake.

— *nebrascensis* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 432, pl. 12, fig. 15. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Yellowstone river, one hundred and fifty miles above its mouth.

— *ornatissima* (Gabb sp.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 128. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; Sucia islands.

Margarita—Continued.— **ornatissima** (Gabb sp.) White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 45. Wash., 1889.
C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

— **triassica** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 136, 137, pl. 17, figs. 8, 8a. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about thirty miles below Devils Portage, Canada.

Margaritana (Schumacher) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 112-114. Wash., 1876. F. B. Meek.

— (Schum., typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 113. Wash., 1876. F. B. Meek.

— **nebrascensis** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 114, 115, pl. 1, figs. 5a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Opposite Sioux city on the Missouri river, in Dakota county, Nebr.

— **nebrascensis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 21, pl. 4, figs. 1, 2. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southeastern Dakota.

Margaritella (M. & H.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 118. Phila., 1864. W. M. Gabb.

— **angulata** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 172, pl. 28, fig. 55. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **crenulata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 118, 119, pl. 20, fig. 74. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near San Diego, Cal.

— **flexistriata** (E. & S.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 302, pl. 19, figs. 11a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne river, near the mouth of Sage creek.

— **globosa** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 119, pl. 29, fig. 225. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Benicia, Cal.

Martesia (Leech) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 145. Phila., 1864. W. M. Gabb.

— (?) **carinifera** n. s. Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 54-56, pl. 9, fig. 7. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **carinifera** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 219, pl. 29, figs. 2, 2a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Shores of Bear Skin bay, in Skidegate inlet.

— **cithara** (Mort. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 304. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **clausa** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 145, pl. 22, fig. 115. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, Butte county; Texas flat, Placer county; Tuscan springs, Tehama county, Cal.

— **clausa** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 175. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, ten miles west of Griswold's and Tejon, Cal.

— **clausa** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 137, 138, pl. 17, figs. 2, 2a, b. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— **cretacea** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 304. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **cuneata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 259, 260, pl. 30, figs. 8a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Long lake, near Fort Pierre, Dak.

— **tumidifrons** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 179, 180, pl. 25, figs. 1, 1a, and 2. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: North Saskatchewan river, township 54, range 2, west of the fourth principal meridian, Northwest Territory.

Martesia—Continued.**—(Pholas) cretacea (Gabb) Whitfield. (1885.)**

Mong. U. S. Geol. Sur., vol. 9, p. 190, pl. 25, figs. 20-23. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Raritan Bay? N. J.

—? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 236. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Meekia n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 191. Phila., 1864. W. M. Gabb.

—bullata n. s. Conrad. (1874.)

Seventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 455. Wash., 1874. T. A. Conrad.

Formation: Cretaceous.

Location: Trout creek, near Fairplay [Colo].

—navis n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 192, 193, pl. 25, fig. 180. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez; Chico creek, and Pence's ranch, Butte county, Cal.

—radiata n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 192, pl. 25, fig. 179a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Rancho de San Luis Gonzaga, in Pacheco's pass; Orestimba canyon, Stanislaus county; Tuscan springs, Tehama county; Siskiyou mountains, Siskiyou county, Cal., Jacksonville, Oreg.

—sella n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 191, 192, pl. 25, fig. 179. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez; Tuscan springs, Tehama county; Siskiyou mountains, Cal.

Meekoceras n. g. Hyatt. (1879.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, pp. 111, 112. Wash., 1880. Alpheus Hyatt.

—aplanatum n. s. White. (1879.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, pp. 112, 113. Wash., 1880. C. A. White.

Formation: Jura-Trias. [Triassic.]

Location: Southeastern Idaho. Locality No. 2.

—aplanatum White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 112, 113, pl. 31, figs. 1a-d. Wash., 1883. C. A. White.

Formation: Triassic.

Location: Locality No. 2, about fifteen miles a little east of south from locality No. 1, southeastern Idaho.

—gracilitatis n. s. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, pp. 114-116. Wash., 1880. C. A. White.

Formation: Jura-Trias. [Triassic.]

Location: Locality No. 1, also locality No. 2, southeastern Idaho.

Meekoceras—Continued.**—gracilitatis White. (1883.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 115, 116, pl. 31, figs. 2a-d. Wash., 1883. C. A. White.

Formation: Triassic.

Location: Locality No. 1, within the limits of Idaho, about sixty-five miles north of the boundary line between that Territory and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles west of Grays lake.

—gracilitatis var. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, p. 116. Wash., 1880. C. A. White.

Formation: Jura-Trias. [Triassic.]

Location: Locality No. 1, southeastern Idaho.

—gracilitatis var. White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 116. Wash. 1883. C. A. White.

Formation: Triassic.

Location: Locality No. 1, within the limits of Idaho, about sixty-five miles north of the boundary line between that Territory and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles west of Grays lake.

—mushbachanus n. s. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, pp. 113, 114. Wash., 1880. C. A. White.

Formation: Jura-Trias. [Triassic.]

Location: Locality No. 1. Southeastern Idaho.

—mushbachianum White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 114. Wash., 1883. C. A. White.

Formation: Triassic.

Location: Locality No. 1. Within the limits of Idaho, about sixty-five miles north of the boundary line between that Territory and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles west of Grays lake.

Megistostoma n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 144. Phila., 1864. W. M. Gabb.

—striata n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 144, pl. 21, figs. 108, 108a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: About a mile northeast of Martinez, Cal.

Melampus (Monfort) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 23. Wash. 1883. C. A. White.

—antiguus n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 507. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville Utah.

—antiguus (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 236, 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Melampus—Continued.— **? antiquus** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 23-25, pl. 12, figs. 11a-d. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville, Utah.

— **antiquus** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 38, pl. 5, figs. 13-16. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **priscus** n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 315. Phila., 1861. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Bear river, near mouth of Sulphur creek, lat. $41^{\circ} 12'$ north, long. $110^{\circ} 52'$ west.

— — **? White.** (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 25, pl. 12, fig. 6a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **? — ? White.** (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 38, pl. 5, fig. 17. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming.

Melania (Lam.) M & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 444. Phila., 1862. Meek & Hayden.

— **anthonyi** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 124. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Yellowstone river, thirty miles above the mouth.

— **convexa** n. s. M & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 125. Phila. 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Bad lands of the Judith.

— **convexa** M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 138. Phila., 1858. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Fort Union, Nebr.

— **humerosa** n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 313. Phila., 1861. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Bear river, lat. $40^{\circ} 12'$ north, long. $110^{\circ} 52'$ west.

— **insculpta** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Rock springs, Wyo.

Melania—Continued.— **insculpta** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bitter creek valley, two miles west of Point of Rocks station, Wyo.

— **insculpta** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 221. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Rock springs, and two miles below Point of Rocks, Wyo.

— **? insculpta** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 94, 95, pl. 20, fig. 4a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Rock springs, Wyo.

— **? insculpta** (Meek) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can. Cont. Can. Paleont., vol. 1, pt. 1, pp. 73, 74, pl. 10, fig. 6. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Coulee "about fourteen miles north-eastward from the most eastern of the Three Buttes" and near the forty-ninth parallel; south Saskatchewan, six miles below the mouth of Bow river; north side of Milk river, five miles below Pa-kaw-ki coulee, and south side of Milk river, one mile above the mouth of Pa-kow-ki coulee, Canada.

— **insculpta** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 54, pl. 26, figs. 4, 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southern Wyoming.

— **invenusta** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 137. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous].

Location: Bad lands of Judith river, Nebr.

— **minutula** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 123, 124. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Three miles below Fort Union.

— **multistriata** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 124. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Ten miles above Fort Union.

— **nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 124, 125. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Ten miles above Fort Union.

— **(?) omitta** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 136. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous].

Location: Mouth of Judith river, Nebr.

Melania—Continued.— **sublævis** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 136, 137. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous.]

Location: Bad lands of Judith river, Nebr.

— **subtortuosa** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 136. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous.]

Location: Mouth of Judith river, Nebr.

— **tenuicarinata** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 137, 138. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous.]

Location: Fort Union, Nebr.

— **warrenana** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 137. Phila., 1858. Meek & Hayden.

Formation: [Cretaceous.]

Location: Summit of Square butte, thirty miles below Fort Clark, on the Missouri, Nebr.

— **wyomingensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 171, 172. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colo.

— **wyomingensis** (Meek) White. 1879.

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 191. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Bijou creek, Colo.

— **wyomingensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 209. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Canyon park, Colo.

— **wyomingensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 213. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colo.

— **wyomingensis** Meek. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 220, 221. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black buttes station, Wyo.

— **wyomingensis** (Meek) White. (1893.)

Third Ann. Rep. U. S. Geol. Sur., p. 54, pl. 26, figs. 1-3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of the South Platte river, Colo., east of the Rocky mountains.

Melania—Continued.— **wyomingensis** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 95, 96, pl. 26, figs. 6a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes station, Wyo.; Danforth hills, Colo., Valley of Crow creek, northern Colo.; other localities east of the Rocky mountains in Colorado.

— **wyomingensis** (Meek) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 21. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Upper Belly river, twenty-two and twenty-three miles above the mouth of the Waterton, Canada.

— (**Goniobasis** ?) **wyomingensis** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 516. Wash., 1873. F. B. Meek.

Formation: [Cretaceous.]

Location: Black butte station, Union Pacific railroad, Wyo.

— (**potodoma**) **veterna** n. s. M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 444, 445. Phila., 1862. Meek & Hayden.

Formation: Cretaceous.

Location: Head Wind river, Nebr.

Melanopsis (Lamarck) White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 96. Wash., 1883. C. A. White.

— **americana** n. s. White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 96, pl. 4, figs. 9 and 10. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of South Platte river, north-eastern Colorado.

— **americana** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 55, pl. 23, figs. 21-23. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: East of the Rocky mountains, in Colo.

Meleagrina (Lam) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 192. Phila., 1869. W. M. Gabb.

— **amygdaloidea** n. s. Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 78, 79, pl. 10, fig. 4. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **antiqua** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 192, 193, pl. 31, fig. 89. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Departure bay, Nanaimo, Vancouver island.

- Meleagrinnella** n. g. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 71, 72. Wash., 1885. R. P. Whitfield.
- **abrupta** (Con.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 72, 73, pl. 14, figs. 11-14. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Freehold, N. J.
- Melina** (?) **mytiloides** (?) (Lam. sp.) Whiteaves. (1876.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 80-82, fig. 8, a-d, p. 80. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **skidegatensis** n. s. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 239. Montreal, 1884. J. F. Whiteaves
Formation: Cretaceous.
Location: South side of Alliford bay, in Skidegate inlet.
- Membranipora** (Blaine) G. & H. (1862.)
Jam. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 157. Phila., 1862, 1863. Gabb & Horn.
- **abortiva** n. s. G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 157, 158 [pl. 20], fig. 41. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek, and near Mullica Hill, N. J.
- **perampla** n. s. G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 158 [pl. 20], fig. 42. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill, N. J.
- **plebia** n. s. G. & H. (1862.)
Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 158, 159 [pl. 20], fig. 43. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill, N. J.
- ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 216. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks station, Wyo.
- ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 217. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks station, Wyo.
- ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.

- Menetus** (subgen. H. & A. Ad.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 536. Wash., 1876. F. B. Meek.
- Meretrix** (Lam.) Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326. Phila., 1855-1858. T. A. Conrad.
- **arata** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 166, pl. 30, fig. 250. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, Shasta county; Siskiyou mountains; Orestimba canyon, Stanislaus county, Cal.
- **californiana** n. s. Conrad. (1855.)
Rep. Expl. and Sur. P. R. R. Miss. River to Pacific ocean, App. Prelim. Geol. Rep. of W. P. Blake, Pal., p. 9. Wash., 1855. T. A. Conrad.
Formation: Tertiary [Cretaceous].
Location: Cañada de las Uvas.
- **californiana** Conrad. (1856.)
Rep. Expl. and Sur. P. R. R. Miss. River to Pacific ocean, vol. 5. App. p. 320, pl. 2, fig. 4. Wash., 1856. T. A. Conrad.
Formation: Tertiary [Cretaceous].
Location: Cañada de las Uvas.
- **californica** (Con.) Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 166, 167. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
- **fragilis** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 185, pl. 30, fig. 77. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- **hornii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 164, pl. 23, fig. 144. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Cal.
- **hornii** Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 185, pl. 30, fig. 78. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
- **lens** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 164, pl. 23, fig. 143. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Chico creek, Butte county, Cal.
- **longa** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 165, pl. 23, fig. 147. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, Placer county, Cal.
- **nitida** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 165, pl. 23, figs. 145, 146. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez; shores of the Straits of Carquines; Orestimba canyon; Chico and Cow creeks, Cal.

Meretrix—Continued.— **ovalis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 166, pl. 30, fig. 251. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

— **tippana** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326, pl. 34, fig. 18. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **uvasana** n. s. Conrad. (1855.)

Rep. Expl. and Sur. P. R. R. Miss. River to Pacific ocean, App. Prelim. Geol. Rep. of W. P. Blake, Pal., p. 9. Wash., 1855. T. A. Conrad.

Formation: Tertiary [Cretaceous].

Location: Cañada de las Uvas.

— **uvasana** Conrad. (1856.)

Rep. Expl. and Sur. P. R. R. Miss. River to Pacific ocean, vol. 5, App. p. 320, pl. 2, fig. 3. Wash., 1856. T. A. Conrad.

Formation: Tertiary [Cretaceous].

Location: Cañada de las Uvas.

— **uvasana** (Can.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 163, 164, pl. 30, fig. 248. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon; near Martinez, Cal.

— **uvasana** (Conrad) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 42. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia and Sheep Jack islands.

Mesalia (Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 332, 333. Wash., 1876. F. B. Meek.

— **? kansasensis** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 333, 334, pl. 2, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **obsuta** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 20, pl. 4, fig. 607. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Pence's ranch, Butte county, Cal.

Mesorhytis (n. subgen.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 356, Wash., 1876. F. B. Meek.

— (subgen.) **? Meek.** (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 364. Wash., 1876. F. B. Meek.

Metacypris forbesii (Jones) White. (1886.)

Bull. U. S. Geol. Sur., No. 29, pp. 23, 24, pl. 4, figs. 22-24. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Canyon city, Colo.

Metacypris—Continued.— **forbesii** (Jones) White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 24, pl. 4, figs. 25, 26. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Canyon city, Colo.

— **? (Jones) White.** (1886.)

Bull. U. S. Geol. Sur. No. 29, p. 24. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Canyon city, Colo.

Metaptera (subgen. Raf.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 516. Wash., 1876. F. B. Meek.

Metis (subgen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 194. Wash., 1876. F. B. Meek.

Micrabacia (Edwards & Haine) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 1. Wash., 1876. F. B. Meek.

— **americana** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 1, 2, pl. 28, figs. 1a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

Micropyrgus Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 574. Wash., 1876. F. B. Meek.

— **minutulus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 575, pl. 43, figs. 18a, b. Wash., 1876. F. B. Meek.

Formation: Probably Eocene. [Cretaceous.]

Location: Three miles below Fort Union, Dak.

— **minutulus** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 98. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Fort Union, on the Upper Missouri river.

— **minutulus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 59, pl. 26, fig. 20. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Fort Union beds.

Microstizia n. g. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 4. Wash., 1876. F. B. Meek.

— **millepunctata** n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 4, pl. 28, figs. 2a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Nebr.

Miliola ? bursa Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 1. Leipzig, 1854. O. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

Miliola—Continued.

- *laevis* Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 2a. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

- *striata* Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 1. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Milthea (subgen. H. & A. Ad.) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, p. 131. Wash., 1876. F. B. Meek.

Mitra [Lam.] Conrad. (1850.)

- Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 39. Phila., 1850-1854. T. A. Conrad.

- *cretacea* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 2, p. 103, pl. 28, fig. 215. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.

- *cretacea* Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 158. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.

- *georgiana* n. s. Conrad. (1850.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 39, pl. 1, fig. 4. Phila., 1850-1854. T. A. Conrad.
Formation: Eocene [Cretaceous?].
Location: Georgia.

Modiola (Lam.) Gabb. (1860.)

- Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 395. Phila., 1858-1860. W. M. Gabb.

- *attenuata* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 36. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: St. Mary river, near its confluence with the Belly river; three miles north of Ross coulee, near Irvine station, Canada.

- *burlingtonensis* n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 65, 66, pl. 17, figs. 8, 9. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington county, N. J.

- *concentrico-costellata* n. s. Roemer. (1849.)
Tex., p. 403. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and San Saba river, Tex.

- *concentrico-costellata* Roemer. (1852.)
Kreide von Tex., p. 54, Taf. 7, figs. 10, a-c. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and San Saba valley, Tex.

Modiola—Continued.

- *cylindrica* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 185, pl. 25, fig. 167. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Pence's ranch, Butte county; Tuscan springs; Martinez, Cal.

- *formosa* (M. & H.) Whiteaves. (1878.)
Geol. Sur. Can., Rep. Prog. for 1876, 1877, p. 153. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Sigutlat lake, British Columbia.

- *formosa* (M. & H.) Whiteaves. (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 403. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Sigutlat lake.

- *granulata-cancellata* n. s. Roemer. (1852.)
Kreide von Tex., pp. 54, 55, Taf. 7, figs. 12a-c. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ravine, three miles from New Braunfels, on road to Seguin, Tex.

- *juliae* n. s. Lea. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 149. Phila., 1862. Isaac Lea.
Formation: Cretaceous.
Location: Haddonfield, N. J.

- *julia* (Lea) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 64, 65, pl. 17, figs. 6, 7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

- *johnsoni* n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 207, pl. 28, figs. 8, 9. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Farmingdale, N. J.

- *major* n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 191, 192, pl. 31, fig. 88. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location. East of Knoxville, Lake county; Morgan valley, south of Clear lake, and at Hot Sulphur springs, east of Clear lake, Colusa county, Cal.

- *ornata* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 184, 185, pl. 24, fig. 166. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez and Marsh's, Cal.

- *ornata* (Gabb) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 167. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest side of Hornby island, Sucla islands.

Modiola—Continued.

- **ovata** n. s. Gabb. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d. ser., 1858-1860, p. 396, pl. 68, fig. 31. Phila., 1858-1860. W. M. Gabb.
 Formation: Cretaceous.
 Location: Timber creek, N. J.
- **ovata** (Gabb) Whitfield. (1885.)
 Mong. U. S. Geol. Sur., vol. 9, p. 197, pl. 26, figs. 13, 14. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Timber creek, N. J.
- **pedernalis** n. s. Roemer. (1849.)
 Tex., p. 403, Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg and San Saba river, Tex.
- **pedernalis** Roemer. (1852.)
 Kreide von Tex., pp. 53, 54, Taf. 7, figs. 11a, b. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg and San Saba valley, Tex.
- **pertenuis** (M. & H.) Whiteaves. (1878.)
 Can. Nat., vol. 8, n. ser., No. 7, pp. 403, 404. Montreal, 1878. J. F. Whiteaves.
 Formation: Jurassic.
 Location: Iltasyouco river and Sigutlat lake.
- **pertenuis** (M. & H.) Whiteaves. (1878.)
 Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 153. Montreal, 1878. J. F. Whiteaves.
 Formation: Jurassic.
 Location: Iltasyouco river, Sigutlat lake, British Columbia.
- **saffordi** n. s. Gabb. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 395, 396, pl. 68, fig. 30. Phila., 1858-1860. W. M. Gabb.
 Formation: Cretaceous.
 Location: Hardeman county, Tenn.
- **siskiyouensis** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 184, pl. 30, fig. 260. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Siskiyou mountains, Cal. and Oreg.; Jacksonville, Oreg.
- **subimbricata** (Meek) Whiteaves. (1884.)
 Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 237. Montreal, 1884. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: East end of Maud island.
- **tenuisculpta** n. s. Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 188, 189, pl. 26, figs. 2, 2a. Montreal, 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Swan river, township 37, range 26 west; Rolling river, township 35, range 26 west, Manitoba.

Modiola—Continued.

- (**Brachydontes**) **dichotoma** n. s. Whiteaves. (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 37, pl. 4, figs. 3, 3a. Montreal, 1885. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: St. Mary river near its confluence with the Belly river, Canada.
- (**Brachydontes**) **multilinigera** n. s. Meek. (1873.)
 Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 492, 493. Wash., 1873. F. B. Meek.
 Formation: Cretaceous.
 Location: Near Coalville, Utah.
- (**Lithodomus** ?) **inflata** n. s. Whitfield. (1885.)
 Mong. U. S. Geol. Sur., vol. 9, pp. 197, 198, pl. 26, figs. 1, 2. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Mr. Ware's pits, near Mullica hill, N. J.
- (**Mytilus**) **dufreynoyi** (d'Orb.) Eichwald. (1871.)
 Geog. Paleont. Bemerck. Halb. Mang. Aleutischen Inseln, p. 128. St. Petersburg, 1871. E. Eichwald.
 Formation: Cretaceous.
 Location: Kadiak and Unga islands, Alaska.
- (**Perna**) **formosa** n. s. M. & H. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 439. Phila., 1862. Meek & Hayden.
 Formation: Jurassic.
 Location: Big Horn mountains, Nebr.
- **sp. undet.** Roemer. (1849.)
 Tex., p. 403, Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall near New Braunfels, Tex.
- **sp. undet.** Roemer. (1852.)
 Kreide von Tex., p. 54, Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall of the Guadalupe below New Braunfels, Tex.
- (**sp. undet.**) Whiteaves. (1876.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 73, 74. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte islands.
- (**sp. undet.**) Hill. (1888.)
 Ann. Rep. Geol. Sur. Ark., for 1888, vol. 2, p. 133, pl. 2, figs. 18, 18a, 19, 19a. Little Rock, 1888. R. T. Hill.
 Formation: Cretaceous.
 Location: Arkansas.
- Modiolaria** (subgen. Beck) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 75. Wash., 1876. F. B. Meek.
- Modiomorpha** ? (H. & W.) Meek. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 103. Wash., 1877. F. B. Meek.

Modiomorpha—Continued.— **? lata n. s. Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 103, 104, pl. 10, fig. 2. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: North fork of Buena Vista canyon, West Humboldt range.

— **? ovata n. s. Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 103, pl. 10, figs. 1, 1a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: North fork of Buena Vista canyon, West Humboldt range.

Moera (subgen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

Molopophorus n. subgen. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 156, 157. Phila., 1869. W. M. Gabb.

Monopleura (Matheson) White. (1884.)

Bull. U. S. Geol. Sur. No. 4, p. 8. Wash., 1884. C. A. White.

— **pinguiscula n. s. White. (1884.)**

Bull. U. S. Geol. Sur. No. 4, pp. 8, 9, pl. 5. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Vicinity of Austin, Tex.

— **pinguiscula (White) Roemer. (1888.)**

Paleont. Abhandl., Vierter Band, Heft 4, pp. 11, 12, Taf. III [xxxiii], figs. 2a-2c. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **marcida n. s. White. (1884.)**

Bull. U. S. Geol. Sur., No. 4, p. 8, pls. 3 and 4. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Vicinity of Austin, Tex.

— **marcida (White) Roemer. (1888.)**

Paleont. Abhandl., Vierter Band, Heft 4, pp. 10, 11, Taf. III [xxxiii], figs. 1a-1d. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **subtriquetra n. s. Roemer. (1852.)**

Kreide von Tex., p. 81, Taf. 5, figs. 5a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: San Saba valley and upper course of Pedernales river, Tex.

— **texana n. s. Roemer. (1852.)**

Kreide von Tex., p. 81, Taf. 5, figs. 3a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, on the Guadalupe above New Braunfels, Tex.

Monotis (Brown) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 31. Phila., 1864. W. M. Gabb.

— **circularis n. s. Gabb. (1869.)**

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 15, 16, pl. 7, figs. 14, 14a, Phila., 1870. W. M. Gabb.

Formation: Triassic.

Location: New pass, near Austin [Nev.].

— **ovalis n. s. Whiteaves. (1889.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 132, 133, pl. 17, fig. 4. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about twenty-five miles below Devil's Portage, Canada.

— **salinaria n. s. Fischer. (1872.)**

Comptes Rend., 1872, vol. LXV, p. 1785. Paris, 1872. P. Fischer.

Formation: Triassic.

Location: Alaska.

— **salinaria (Brown) Fischer. (1872.)**

Voyages à la Côte Nord-ouest de l'Amérique, pp. 33, 34, pl. 4, fig. 2, par Alph. L. Pinart. Paris, 1875. P. Fischer.

Formation: Triassic.

Location: Alaska.

— **septentrionalis n. s. Haughton. (1856.)**

Jour. Roy. Dublin Soc., vol. 1, No. 4, p. 245, pl. 9, figs. 6, 7. Dublin, 1858. S. Haughton.

Formation: Jurassic.

Location: Point Wilkie, Prince Patrick's land.

— **subcircularis n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 31, pl. 6, figs. 29, 29a. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Gifford's ranch, Plumas county, Cal.; Star district, Humboldt county, Nev.

— **subcircularis (Gabb) Whiteaves. (1877.)**

Geol. Sur. Can., Rep. Prog. for 1875, 1876, App. II, p. 97. Montreal, 1877. J. F. Whiteaves.

Formation: Triassic.

Location: A few miles above Fossil point, Peace river.

— **subcircularis (Gabb) Whiteaves. (1887.)**

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886, App. I, p. 108, B. Montreal, 1887. J. F. Whiteaves.

Formation: Triassic.

Location: A few miles above Fossil point, on the Peace river, lat. 56° 10' long. 122° 10'; Fossil ridge, Upper Pine river, lat. 55° 30' long. 122°; south side of Houston Stewart channel, Queen Charlotte islands, nearly opposite Rose harbor; Section cove, north end of Barnby island, Q. C. I.; south side of Skidegate channel, Q. C. I.; a mile and a half west of Log point.

Monotis—Continued.**—subcircularis (Gabb) Whiteaves. (1889.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 131, 132, pl. 17, figs. 3, 3a. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: A few miles above Fossil point on the Peace river, in lat. $56^{\circ} 10'$ and long. $122^{\circ} 10'$; Fossil ridge, Upper Pine river, in lat. $55^{\circ} 30'$ and long. 120° ; Whipsaw creek, headwaters of the Similkameen; south side of Skidegate channel, Q. C. I., a mile and a half west of Long point, Canada.

Montivaltia attantica (Mort. sp.) Lonsdale. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, pp. 65-67, figs. a, b, p. 65. London, 1845. William Lonsdale.

Formation: Cretaceous.

Location: Timber creek, N. J.

Morea n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290. Phila., 1858-1860. T. A. Conrad.

—(subgen. Con.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301. Phila., 1858-1860. W. M. Gabb.

—cancellaria n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290, pl. 46, fig. 30. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala., and Tippah county, Miss.

Morio (Montf.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 104. Phila., 1864. W. M. Gabb.

—(Sconsia) tuberculatus n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 104, 105, pl. 19, fig. 57. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bulls Head point, Martinez; Clayton, Contra Costa county; near San Diego, Cal.

Mortoniceras n. g. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 448, 449. Wash., 1876. F. B. Meek.

—shoshonense n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 449, 450, pl. 6, figs. 3a, c and 6a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Head of Wind river valley, Wyo.

—? vermillionense (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 450-452, pl. 7, figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Vermilion river, Nebr.

Multicresis (d'Orb.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 401. Phila., 1858-1860. W. M. Gabb.

—parvicella n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 367. Phila., 1861. Gabb & Horn.

Formation: Cretaceous.

Location: New Jersey.

Multicresis parvicella (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 401, pl. 69, figs. 36-38. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

—parvicella G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 178 [pl. 21], fig. 70. Phila., 1862, 1863. Gabb & Horn.

Formation: Miocene [Cretaceous].

Location: Timber creek and near Mullica hill, N. J.

Mya (Linn.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, p. 124. St. Petersburg, 1871. E. Eichwald.

—crassa (Grew.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, p. 124. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula and Unga island.

—sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 285. New Haven, 1830. S. G. Morton.

Formation: [Cretaceous.]

Myacites (Schlot.) Conrad. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 166. Phila., 1858. T. A. Conrad.

—depressus n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 51, 52, pl. 8, figs. 6, 6a. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

—depressus (Meek) Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 11. Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walkers lake, Nev.

—inconspicuus n. s. Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 137, pl. 12, fig. 10. Wash., 1877. F. B. Meek.

Formation: Jurassic.

Location: Weber canyon, Wasatch range, Utah.

—nebrascensis n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 182. Phila., 1861. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Nebr.

Myacites—Continued.

- **nebrascensis** M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 100, 101, pl. 4, fig. 5. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- **pennsylvanicus** n. s. Conrad. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 166. Phila., 1858. T. A. Conrad.
Formation: Black shale. [Triassic?]
Location: Phoenixville, Penn.
- **pertenuis** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 51. Phila., 1859. Meek & Hayden.
Formation: Jurassic.
Location: West base of Black hills.
- **subcompressus** (Meek) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1., pp. 151, 152, pl. 38, figs. 5a-e. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Near lower canyon of Yellowstone river, Mont.
- **subellipticus** M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 101, pl. 4, figs. 6, a-c. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- (**Panopoea** ?) **humboldtensis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 28, pl. 5, fig. 22. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Buena Vista district, Humboldt mining region, Nev.
- (**Pleuromya**) **subcompressa** Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 136, 137, pl. 12, figs. 6, 6a. Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Weber canyon, Wasatch range, Utah.
- (**Pleuromya**) **weberensis** n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 127, 138, pl. 12, figs. 11, 11a. Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Weber canyon, Wasatch range, Utah.
- Myalina** (De Koninck) Whitfield. (1876.)
Rep. Rec. Carroll, Mont., to Yellowstone National Park, p. 143. Wash., 1876. R. P. Whitfield.
- ? (**Gervillia**) **perplana** n. s. Whitfield. (1876.)
Rep. Rec. Carroll, Mont., to Yellowstone National Park, p. 143, pl. 1, fig. 8. Wash., 1876. R. P. Whitfield.
Formation: Jurassic.
Location: Bridger mountains, Mont.

Myophoria (Brown) Gabb. (1864.)

- Geol. Sur. Cal. Paleont., vol. 1, p. 33. Phila., 1864. W. M. Gabb.
- **alta** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 33, pl. 6, fig. 33. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Dun glen, Sierra district, Humboldt county, Nev.
- **ambilineata** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 166, 167, pl. 13, figs. 5a, b. Wash., 1875. C. A. White.
Formation: Jurassic.
Location: Camp Cottonwood, old Mormon road, Nev.
- **lineata** (Münster ?) Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 133, 134, pl. 12, figs. 3, 3a. Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Weber canyon, Wasatch range, Utah.
- Myrtea** (subgen. Turton) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 130. Wash., 1876. F. B. Meek.
- Mysia** (Leach) Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 278. Phila., 1858-1860. T. A. Conrad.
- **gibbosa** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 302, pl. 48, fig. 18 [17]. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Delaware & Chesapeake canal, and N. J.
- **parilis** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 278, pl. 46, fig. 8. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- ? **polita** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 178, pl. 30, fig. 256. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez; Clayton, Cal.
- Mytiloides** (subgen. Brong.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 39. Wash., 1876. F. B. Meek.
- Mytilus** (Linn.) Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 29. Phila., 1864. W. M. Gabb.
- (Linn. typical.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 68. Wash., 1876. F. B. Meek.
- **attenuatus** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 86. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.

Mytilus—Continued.

- **ascia** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 183, pl. 30, fig. 259. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Fort Tejon, Cal.
- **condecoratus** n. s. Conrad. (1875.)
Rep. Geol. Sur., N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 5, pl. 1, fig. 10. T. A. Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.
- **homfrayi** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 29, pl. 6, fig. 25. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Dun glen, Seirra district, Humboldt county, Nev.
- **humerus** n. s. Conrad. (1855.)
Rep. Expl. and Sur. P. R. R. Mississippi River to Pacific Ocean, App., Prelim. Geol. Rep. of W. P. Blake, pal., p. 10. Wash., 1855. T. A. Conrad.
Formation: Tertiary [Cretaceous].
Location: Cañada de las Uvas.
- **humerus** Conrad. (1856.)
Rep. Expl. and Sur. P. R. R. Mississippi River to Pacific Ocean, vol. 5, App. p. 321, pl. 2, fig. 10. Wash., 1856. T. A. Conrad.
Formation: Tertiary [Cretaceous].
Location: Cañada de las Uvas.
- **humerus** (Con.) Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 184. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
- **lanceolatus** (J. Sowerby) Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 236, 237, pl. 31, fig. 7, 7a. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: Shingle bay, Skidegate inlet.
- **meekii** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 40. St. Louis, 1856-1860. Evans & Shumard.
Formation: Cretaceous.
Location: Moreau river.
- **multistriatus** n. s. Meek. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 49, pl. 7, figs. 7, 7a. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genesee valley, Plumas county, Cal.
- **nasutus** n. s. Conrad. (1875.)
Rep. Geol. Sur., N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 5, pl. 1, fig. 9. T. A. Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.
- **oblivius** n. s. Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 64, pl. 17, fig. 1. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Pits of the Rev. G. C. Schanck, near Marlboro, N. J.

Mytilus—Continued.

- **pauperculus** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 183, pl. 25, fig. 165. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: West of Martinez, Cal.
- **pauperculus** (Gabb) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 167. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands.
- **pauperculus** (Gabb?) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 38. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sheep Jack island.
- **quadratus** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 191, pl. 31, fig. 87. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez and Tuscan Springs, Cal.
- **semiplicatus** n. s. Roemer. (1849.)
Tex., pp. 402, 403. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Ravine on the Guadalupe, three miles below New Braunfels, Tex.
- **semiplicatus** Roemer. (1852.)
Kreide von Tex., p. 55, Taf. 7, fig. 3. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ravine, three miles from New Braunfels on road to Seguin, Tex.
- **subarcuatus** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 276. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Dog river, near mouth of Judith river, Nebr.
- **subarcuatus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 69, pl. 38, fig. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Dog river, near the mouth of Judith river.
- **subarcuatus** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 56. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Saskatchewan, eight miles below the Red Deer river, Canada.
- **subrectus** n. s. Eichwald. (1861.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 184, 185, Taf. 16, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

Mytilus—Continued.

- **tenuitesta n. s. Roemer.** (1849.)
 Tex., p. 403. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg, Tex.
- **tenuitesta Roemer.** (1852.)
 Kreide von Tex., pp. 55, 56, Taf. 7, figs. 13a, b.
 Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Fredericksburg, Tex.
- **whitei n. s. Whitfield.** (1877.)
 U. S. Geogr. and Geol. Sur. Rocky Mt. region;
 Prelim. Rep. Paleont. Black Hills, p. 18. Wash.,
 1877. R. P. Whitfield.
 Formation: Jurassic.
 Location: Near Sun Dance hills, northwestern
 Black hills, Wyo.
- **whitei Whitfield.** (1880.)
 Rep. Geol. Black Hills of Dak., pp. 360, 361,
 pl. 5, figs. 9-12. Wash., 1880. R. P. Whitfield.
 Formation: Jurassic.
 Location: Near Sun Dance hills, Black hills.
- **whitei (Whitfield) White.** (1880.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pt. 1, p. 147, pl. 37, fig. 9a. Wash., 1883.
 C. A. White.
 Formation: Jurassic.
 Location: Near Fontanelle canyon, upon the west
 side of Green river basin, western Wyoming.
- ? — **Say.** (1820.)
 Am. Jour. Sci., 1st ser., vol. 2, p. 45. New Haven,
 1820. Thomas Say.
 Formation: Alluvium [Cretaceous].
 Location: Mullica hill, N. J.
- Naidea (subgen. Swain.) Meek.** (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash.,
 1876. F. B. Meek.
- Nassa (Lam.) Gabb.** (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 97. Phila.,
 1864. W. M. Gabb.
- **antiquata n. s. Gabb.** (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 97, pl. 18, fig.
 50. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Bulls Head point, near Martinez, Cal.
- **cretacea n. s. Gabb.** (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 97, pl. 18, fig.
 49. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Bulls Head point, near Martinez, Cal.
- **globosa n. s. Gabb.** (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 282.
 Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: North Carolina and Pataula creek, Ga.
- Natica [Lam.] Morton.** (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 48, Phila.,
 1834. S. G. Morton.
- **(Adanson) Meek.** (1859.)
 Northwest Terr. Rep. Prog. Assin. and Saskat.
 Expl. Exped., H. Y. Hind, p. 184. Toronto,
 1859. F. B. Meek.

Natica—Continued.

- **abyssina n. s. Morton.** (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 49, pl. 13,
 fig. 13. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Prairie bluff, Ala.
- **acutispira n. s. Shumard.** (1859.)
 Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp.
 597, 598. St. Louis, 1856-1860. B. F. Shu-
 mard.
 Formation: Cretaceous.
 Location: Parker county, near Brazos river, Tex.
- **acutispira (Shum.) Gabb.** (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, pp. 363,
 364. Phila., 1862. W. M. Gabb.
 Formation: Cretaceous.
- **alveata n. s. Conrad.** (1855.)
 Rep. Expl. and Sur., P. R. R. Mississippi River to
 Pacific Ocean; App. Prelim. Geol. Rep. of W.
 P. Blake, pal. p. 10. Wash., 1855. T. A. Con-
 rad.
 Formation: Tertiary [Cretaceous].
 Location: Cañada de las Uvas.
- **alveata Conrad.** (1856.)
 Rep. Expl. and Sur. P. R. R. Mississippi River to
 Pacific Ocean, vol. 5, App., p. 321, pl. 2, figs. 8,
 8a. Wash., 1856. T. A. Conrad.
 Formation: Tertiary [Cretaceous].
 Location: Cañada de las Uvas.
- **? ambigua n. s. M. & H.** (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 64.
 Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Moreau trading post, Nebr.
- **collina n. s. Conrad.** (1857.)
 Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2,
 p. 157, pl. 13, figs. 2a, b. Wash., 1857. T. A.
 Conrad.
 Formation: Cretaceous.
 Location: Between Rio San Pedro and Rio Puer-
 cos.
- **concinna n. s. H. & M.** (1854.)
 Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p.
 389, pl. 3, figs. 2a-d. Cambridge and Boston,
 1855. Hall and Meek.
 Formation: Cretaceous.
 Location: Sage creek.
- **gibbosa (Lea) Conrad.** (1855.)
 Rep. Expl. and Sur. P. R. R. Mississippi River to
 Pacific Ocean, App. Prelim. Geol. Rep. of W.
 P. Blake, Pal., p. 10. Wash., 1855. T. A.
 Conrad.
 Formation: Tertiary [Cretaceous].
 Location: Cañada de las Uvas.
- **gibbosa (Lea) Conrad.** (1856.)
 Rep. Expl. and Sur. P. R. R. Mississippi River to
 Pacific Ocean, vol. 5, App., p. 321. Wash.,
 1856. T. A. Conrad.
 Formation: Tertiary [Cretaceous].
 Location: Cañada de las Uvas.

Natica—Continued.

- **infracarinata** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, pp. 319, 320.
Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Crosswicks, N. J.
- **? leilia** n. s. H. & W. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 2,
pp. 298, 299, pl. 7, figs. 19-21. Wash., 1877.
Hall & Whitfield.
Formation: Triassic? [Jurassic].
Location: Northwest of Rawlings station, Wyo.,
and on the east fork of Duchesne river, Uinta
range, Utah.
- **moreauensis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 64.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **obliquata** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p.
389, pl. 3, fig. 1, a, b. Cambridge and Boston,
1855. Hall & Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **obliquata** (H. & M.) Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat.
Expl. Exped., H. Y. Hind, p. 184. Toronto,
1859. F. B. Meek.
Formation: Cretaceous.
Location: Two creeks on the Assiniboine, Canada.
- **occidentalis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 64.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.
- **oetites?** Conrad. (1855.)
Rep. Expl. and Sur. P. R. R. Mississippi River to
Pacific Ocean. App. Prelim. Geol. Rep. of W.
P. Blake, Pl. p. 10. Wash., 1855. T. A. Conrad.
Formation: Eocene [Cretaceous].
Location: Cañada de las Uvas.
- **oetites?** Conrad. (1856.)
Rep. Expl. and Sur. P. R. R. Mississippi River
to Pacific Ocean, vol. 5, App. p. 321, pl. 2, fig. 7.
Wash., 1856. T. A. Conrad.
Formation: Eocene [Cretaceous].
Location: Cañada de las Uvas.
- **paludinæformis** n. s. H. & M.
(1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp.
389, 390, pl. 3, figs. 3a-c. Cambridge and Bos-
ton, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri river and
Sage creek.
- **? pedernalis** n. s. Roemer. (1849.)
Tex., p. 410. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Locality: Fredericksburg, Tex.

Natica—Continued.

- **pedernalis** Roemer. (1852.)
Kreide von Tex., pp. 43, 44, Taf. 4, figs. 1a, b.
Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **petrosa** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 48, 49, pl.
19, fig. 6. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Prairie bluff, Ala.
- **? prægrandis** n. s. Roemer. (1849.)
Tex., pp. 410, 411. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **prægrandis** Roemer. (1852.)
Kreide von Tex., p. 44. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: On the upper course of Pedernales
river, Tex.
- **subcrassa** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 87.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.
- **texana** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
157, pl. 13, fig. 1, a, b. Wash., 1857. T. A.
Conrad.
Formation: Cretaceous.
Location: Between Rio San Pedro and Rio
Puercos.
- **tuomeyana** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 270.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr.
- (**Amauropsis**) **avellana** n. s. Roe-
mer. (1888.)
Paleont. Abhandl. Vierter Band., Heft. 4, p. 14,
15, Taf. I [xxx], fig. 15. Berlin, 1888. F.
Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Bartons
creek, near Austin, Tex.
- (**Lunatia**) **rectilabrum** n. s. Conrad.
(1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 334, pl. 35, fig. 28. Phila., 1855-1858.
T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.
- [Lam.] Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, p. 45. New Haven,
1820. Thomas Say.
Formation: [Cretaceous].
Location: Mullica hill, N. J.
- **sp. undet.** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 282. New
Haven, 1830. S. G. Morton.
Formation: Ferruginous sand. [Cretaceous].
Location: [New Jersey. ?]

Natica—Continued.

- *sp. undet.* Troost. (1840.)
Fifth Geol. Rep. Tenn., p. 56. Nashville, 1840.
G. Troost.
Formation: Cretaceous.
Location: McNairy county, Tenn.
- — Forbes. (1844.)
Quart. Jour. Geol. Soc. London, vol. 1, p. 63, fig. b, p. 63. London, 1845. Edward Forbes.
Formation: Cretaceous.
Location: New Jersey.
- *sp. undet.* Roemer. (1849.)
Tex., p. 411. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- *sp. undet.* Roemer. (1852.)
Kreide von Tex., p. 44. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- *sp. undet.* Owen. (1860.)
Second Rep. Geol. Rec. Ark., pl. 8, fig. 3. Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.
- *sp. undet.* Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two and a fourth and two and a half miles up.
- *sp. undet.* Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 264. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Gabriola island.
- (Adanson) White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 45. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sheep Jack island.

Naticina (Gray) Gabb. (1864.)

- Geol. Sur. Cal. Paleont., vol. 1, p. 109. Phila., 1864. W. M. Gabb.
- *obliqua n. s.* Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 109, pl. 21, fig. 112. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Northeast of Martinez; Cañada de las Uvas and vicinity, Cal.

Nautilus [Linn] Morton. (1834.)

- Synop. Org. Rem. Cret. Gr. U. S., p. 33. Phila., 1834. S. G. Morton.
- (Linn, typical) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 490. Wash., 1876. F. B. Meek.
- *alabamensis n. s.* Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 33, pl. 18, fig. 3. Phila., 1834. S. G. Morton.
Formation: Newer Cretaceous [Tertiary].
Location: Near Claiborne, Ala.

Nautilus—Continued.

- *bryani n. s.* Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 277. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Vincenttown, N. J.
- *campbelli n. s.* Meek. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 318. Phila., 1862. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, eastern shore of Vancouver island.
- *campbelli* Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 273, pl. 6, figs. 2, 2a. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, Vancouver island.
- *campbelli* (Meek) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 99, pl. 11, figs. 2, 2a, b. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Comox, Vancouver island; northwest side of Hornsby island; Sucia islands.
- *dekayi n. s.* Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 291, pl. 8, fig. 4. New Haven, 1833. S. G. Morton.
Formation: [Cretaceous.]
- *dekayi* Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 33, pl. 8, fig. 4, pl. 13, fig. 4. Phila., 1834. S. J. Morgan.
Formation: Cretaceous.
Location: Monmouth and Burlington counties, N. J.; Prairie bluff, Ala.
- *dekayi* (Mort.) Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind., p. 185, pl. 2, figs. 9, 10. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: South branch of the Saskatchewan, Canada.
- *dekayi* (Morton) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 277. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Ga.
- *dekayi* (Mort.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 496-498, pl. 27, figs. 1a, e, fig. 67, p. 496. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Sage creek and Yellowstone river.
- *dekayi var. montanaensis n. var.* Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 8, p. 498, pl. 27, figs. 2a-e. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, Mont., one hundred and fifty miles from its mouth.

Nautilus—Continued.— **dekayi** var. **montanaensis** (Meek) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 439, 440, pl. 16, figs. 10, 11. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.

— **elegans** (Sow.) Roemer. (1849.)

Tex., p. 418. Bonn, 1849. F. Roemer.
Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— **elegans** (Sow.) Roemer. (1852.)

Kreide von Tex., p. 37. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe, below New Braunfels, Tex.

— **elegans** (Sow.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 499-501, pl. 8, figs. 2a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Chippewa point, Mont.

— **elegans** (Sow.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 278. Phila., 1876. W. M. Gabb.

Formation: Cretaceous

— **elegans** var. **nebrascensis** n. var. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, p. 25. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the upper Missouri.

— **liardensis** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 137, 138, pl. 18, figs. 1, 1a. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about twenty-five miles below Devils Portage, Canada.

— **multicameratus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 20, pl. 3, figs. 4, 5. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Dun glen, near the Auld Lang Syne mine, Sierra district, Humboldt county, Nev.

— **simplex** (Sow.) Roemer. (1849.)

Tex., p. 418. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— **simplex** (Sow.) Roemer. (1852.)

Kreide von Tex., p. 37. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall of the Guadalupe below New Braunfels, Tex.

— **suciensis** n. s. Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 97-99, pl. 11, figs. 1, 1a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

Nautilus—Continued.— **suciensis** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 197, 198, pl. 21. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Skidegate inlet, one mile and three-quarters southwest of Welcome point; Bay east of Alliford bay.

— **texanus** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 590. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Near Austin and Bluffs of Red river, in Grayson county, Tex.

— **texanus?** (Shum.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 59, pl. 9, figs. 3a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Aldersons gulch, Shasta county; near Mount Diablo, Cal.

— **whitneyi** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 19, 20, pl. 3, figs. 2, 3. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Buena Vista district, Humboldt mining region.

— **n. s. Hill.** (1889.)

Geol. Sur. Tex. Bull. No. 4, p. 21. Austin, 1889. R. T. Hill.

Formation: Cretaceous.

Location: Austin, Tex.

— **sp. Whiteaves.** (1874.)

Geol. Sur. Can., Rep. Prog., for 1873-1874, p. 261. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— **sp. undet. Gabb.** (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 277. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Near Vincenttown, N. J.

— **sp. undet. Whiteaves.** (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 14-19. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

Neæra (Gray) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 203. Boston, 1862. B. F. Shumard.

— **alæformis** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, p. 203. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Bluffs of Red river, Fannin county, Tex.

— **dolabræformis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 153, pl. 22, fig. 125. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: East of Martinez, Cal.

Neæra—Continued.

- **gibba** n. s. Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 169, 170, Taf. 16, figs. 13, 14. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **longirostra** n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur., Rocky Mt. region, Prelim. Rep. Paleont. Black Hills, pp. 24, 25. Wash., 1877. R. P. Whitfield.
Formation: Jurassic.
Location: Redwater valley, Black hills Dak.
- **longirostra** Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 376, pl. 5, fig. 35. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Redwater valley, Black hills.
- **moreauensis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 239, 240, pl. 17, fig. 11a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak., and on the Yellowstone river.
- **moreauensis** (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 420, pl. 11, fig. 31. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: At the forks of the Cheyenne river, Black hills.
- **moreauensis** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 44. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Old Wives creek, township 10, range 11, west of third principal meridian, Canada.
- **? pumila** n. s. Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln, pp. 170, 171, Taf. 16, figs. 15, 16. St. Petersburg 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **striata** n. s. Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. Aleutischen Inseln. p. 170, Taf. 16, figs. 11, 12. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **ventricosa** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 238, 239, pl. 30, figs. 3, a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak.

Neitheia (Drouet) Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 269. Phila., 1856. T. A. Conrad.

Neitheia—Continued.

- **complexicostata** n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 319. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Uniontown, Ala.
- **grandicosta** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 200, pl. 33, figs. 99, a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek, Shasta county, Cal.
- **mortoni** Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, pp. 365, 366. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey, Alabama, and Tennessee.
- **occidentalis** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854-1855, p. 269. Phila., 1856. T. A. Conrad.
Formation: Cretaceous.
Location: [Texas].
- **occidentalis** Conrad. (1857.)
Rép. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 150, 151, pl. 5, figs. 1a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera, Tex.
- **quinquecostata** (Sow.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 56, 57, pl. 8, figs. 12-14. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington, Holmdel, Freehold, Mullica hill, N. J.
- **texana** (Roem.) Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 151, pl. 5, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Between El Paso and Frontera.
- Nemoarca** n. g. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 97. Phila., 1870. T. A. Conrad.
- **cretacea** n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 3, Phila., 1869-1870, p. 97, pl. 9, fig. 21. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **cretacea** (Con.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 86, 87, pl. 12, figs. 8-10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, and near Keyport, N. J.
- Nemocardium** (n. subgen. Meek.) (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 167. Wash., 1876. F. B. Meek.
- Nemodon** n. g. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 97. Phila., 1870. T. A. Conrad.

Nemodon—Continued.**—angulatum Gabb. (1876.)**

Proc. Acad. Nat. Sci., Phila., for 1876, p. 316.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

—angulatum (Gabb.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 84, 85, pl. 12,
figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Burlington county, N. J.

—brevifrons n. s. Conrad. (1875.)

Rep. Geol. Sur., N. C., vol. 1. Raleigh, 1875, W.
C. Kerr. App. A, p. 4, pl. 1, fig. 15. T. A. Con-
rad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

—brevifrons (Con.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 85, 86, pl. 12,
figs. 1, 2. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

—eufalensis n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 97,
pl. 9, fig. 16. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

—eufalensis (Gabb) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 83, 84, pl. 12,
figs. 3-5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel and Haddonfield, N. J.

—fischeri (d'Orb. sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol.
1, pt. 3, p. 234, pl. 31, fig. 5. Montreal, 1884.
J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud island.

—fischeri (d'Orb. sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1,
pt. 3, p. 250. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

—sulcatus (E. & S. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 82, 83, pl.
15, figs. 6a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and
fifty miles above its mouth.

—vancouverensis (Meek sp.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 163,
164, pl. 19, figs. 1, 1a. Montreal, 1879. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Southwest side of Hornby island, south-
east end and southwest side of Denman island,
Sable river and Blunden point, Vancouver
island.

Neptunea (Bolton) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 389. Phila., 1858-1860. W. M. Gabb.

—curvirostris n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 88, pl. 18, fig.
37. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cow creek Shasta county, Cal.

—gracilis n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 90, pl. 18, fig.
42. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bulls Head point, northeast of Mar-
tinez, Cal.

—gracilis Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 149. Phila.,
1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

—hoffmannii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 90, pl. 18, fig.
41. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Cal.

—impressa n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, pp. 389, 390, pl. 68, fig. 5. Phila., 1858-
1860. W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tenn.

—mucronata n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 147, pl. 26, fig.
25. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

—perforata n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 89, pl. 18, fig.
39. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Cal.

—ponderosa n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 88, pl. 18, fig. 38.
Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs (Lick springs), Pence's
ranch, above Orville, Butte county, Cal.

—? supraplicata n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 89, pl. 18, fig.
40. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: San Diego; Clayton (?) Contra Costa
county, Cal.

—(Tritonofusus) cretacea n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 146, 147, pl.
26, fig. 24. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Neptunella n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 344. Wash.
1876. F. B. Meek.

Nerinea (Defrance) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 158. Wash., 1857. T. A. Conrad.

— **acus** n. s. Roemer. (1849.)

Tex., p. 412, Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.

— **acus** Roemer. (1852.)

Kreide von Tex., p. 42, Taf. 4, figs. 10a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.

— **? anguillina** (Castillo and Barcena.) (1877.)

Ann. Museo. Nac. Mex., Tomo 1, pp. 201, 202, figs. 25, 26. Mexico, 1877-1879. M. Barcena.
Formation: Cretaceous.
Location: Huetamo, state of Michoacan; cavern of Cacahuamilpa, Mexico.

— **austinensis** n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, p. 17, Taf. I [xxx], fig. 8. Berlin, 1888. F. Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **castilli** Barcena. (1877.)

Ann. Museo. Nac. Mex., Tomo 1, pp. 200, 201, figs. 18, 22. Mexico, 1877-1879. M. Barcena.
Formation: Cretaceous.
Location: State of Queretaro, Morelos, Hidalgo, Michoacan, Mexico.

— **castilli** (Barcena) Urquiza. (1882.)

Ann. Min. Fomento Rep. Mex., Tomo 7, p. 224, figs. 9, 11. Mexico, 1882. M. Urquiza.
Formation: Cretaceous.
Location: Astalan and Rincon, Coalcoman district, state of Michoacan, Mexico.

— **cultrispira** n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, pp. 17, 18, Taf. I [xxx], fig. 9. Berlin, 1888. F. Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **dispar** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 113, pl. 19, figs. 66, 66a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North fork of Cottonwood creek, Shasta county, Cal.

— **goodhallii** ? Barcena. (1877.)

Ann. Museo. Nac. Mex., Tomo 1, p. 201, fig. 24. Mexico, 1877-1879. M. Barcena.
Formation: Cretaceous.
Location: Near Orizaba, Mexico.

— **hieroglifica** ? Barcena. (1877.)

Ann. Museo. Nac. Mex., Tomo 1, p. 201, fig. 23. Mexico, 1877-1879. M. Barcena.
Formation: Cretaceous.
Location: Cavern of Cacahuamilpa, in Barranca Leca, and near Orizaba, Mexico.

Nerinea—Continued.— **hieroglifica** (Barcena) Urquiza. (1882.)

Ann. Min. Fomento Rep. Mex., Tomo 7, p. 224, figs. 10, 12. Mexico, 1882. M. Urquiza.
Formation: Cretaceous.
Location: Cerro de los Guzimanos, and road to Rincon, Coalcoman district, state of Michoacan, Mexico.

— **maudenses** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 214, 215, pl. 27, figs. 2, 2a-d. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East end of Maud island, opposite Leading island, in Skidegate inlet.

— **schottii** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 158, 159, pl. 14, figs. 3a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Oak creek, near mouth of Puercos river.

— **subula** n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, p. 18, Taf. I [xxx], fig. 10. Berlin, 1888. F. Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **texana** Roemer. (1852.)

Kreide von Tex., p. 41, Taf. 4, fig. 7. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, and on the upper course of the Pedernales river, Tex.

— **sp. undet. (?)** Roemer. (1849.)

Tex., pp. 411, 412. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Upper course of Pedernales river, Tex.

— **sp. undet.** Roemer. (1852.)

Kreide von Tex., p. 41, Taf. 4, fig. 8. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: On the upper course of the Pedernales river, Tex.

— **sp. undet.** Roemer. (1852.)

Kreide von Tex., pp. 41, 42, Taf. 4, fig. 9. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: On the upper course of the Pedernales river, Tex.

Nerita (Linn) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 137. Phila., 1864. W. M. Gabb.

— **cuneata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 137, 138, pl. 21, fig. 97. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.

— **deformis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 137, pl. 21, fig. 96. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North fork of Cottonwood creek, Cal.

Nerita—Continued.**—(Theliostyla) triangulata n. s. Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, p. 170, pl. 28, figs. 52, 52a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: New Idria, Cal.

— ? White. (1885.)

Bull. U. S. Geol. Sur., No. 22, p. 12, pl. 5, figs. 7, 8. Wash., 1885. C. A. White.
Formation: Cretaceous, Wallala group.
Location: Shore of Tedos Santos bay, Lower California.

Neritella (Hump.) M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 444. Phila., 1862. Meek & Hayden.

— nebrascensis n. s. M. & H. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 444. Phila., 1862. Meek & Hayden.
Formation: Cretaceous.*
Location: Head of Wind river, Nebr.

— nebrascensis M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 109, 110, fig. 3 text. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Head of Wind river, Dak.

Neritina (Lam.) White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, G. M. Wheeler, p. 24. Wash., 1874. C. A. White.

— (Lam.) White. (1874.)

Prelim. Rep. Invert. Foss., Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, p. 24. Wash., 1874. C. A. White.

— bannisteri (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 237. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

— bannisteri (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., part 1, pp. 25, 26, pl. 12, figs. 10a-c. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Carletons coal mine, Coalville, Utah.

— bannisteri (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 5, figs. 11, 12. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

— bruneri n. s. White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, pp. 95, 96, pl. 4, figs. 7, 8. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of South Platte river, north-eastern Colorado.

Neritina—Continued.**— bruneri White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 53, pl. 23, figs. 12, 13. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: East of the Rocky mountains in northern Colorado.

— incompta n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 250. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyo.

— incompta White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 308, 309, pl. 7, figs. 6a-c. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Sulphur creek, near Hilliard station, Wyo.

— naticiformis n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 715. Wash., 1878. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, near the mouth of Sulphur creek, Wyo.

— naticiformis White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 244. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near Nellis station, Wyo.

— naticiformis White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 89, pl. 30, figs. 3a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near mouth of Sulphur creek, valley of Bear river, Wyo.

— naticiformis White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 7, figs. 5, 6. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

— nebrascensis (M. & H.) White (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 51, pl. 3, figs. 10, 11. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Vicinity of the Black hills.

— nebrascensis (M. & H.) White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 23, pl. 4, fig. 16. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Black hills of Dakota.

— nebrascensis ? (M. & H.) Hill. (1888.)

Ann. Rep. Geol. Sur. Ark., for 1888, vol. 2, p. 129. Little Rock, 1888. R. T. Hill.
Formation: Cretaceous?
Location: Arkansas.

[*Referred to the Jurassic by Mr. Meek in 1865. See Meek, F. B., Pal. Up. Missouri, pp. 109, 110.

The true geological age of the strata is yet in doubt. Wash., 1865.]

Neritina—Continued.

- **phaseolaris** n. s. White. (1874.)
Prelim. Rep. Geogr. and Geol. Expl. and Sur.
west of one-hundredth meridian. G. M.
Wheeler, p. 24. Wash., 1874. C. A. White.
Formation: Jurassic.
Location: Salt creek, near Nephi, Utah.
- **phaseolaris** n. s. White. (1874.)
Prelim. Rep. Invert. Foss., Geogr. and Geol. Expl.
and Sur. west of one-hundredth meridian, p.
24. Wash., 1874.
Formation: Jurassic.
Location: Salt creek, near Nephi, Utah.
- ? **phaseolaris** White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, pp. 167, 168,
pl. 13, figs. 1a-e. Wash., 1875. C. A. White.
Formation: Jurassic.
Location: Salt creek, near Nephi, Utah.
- **pisiformis** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pp. 500, 501. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.
- **pisiformis** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **pisiformis** (Meek) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 26, 27. Wash., 1883. C. A.
White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **pisum** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 308, pl. 7, figs. 11a-c. Wash., 1879.
C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **pisum** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- ? **powelli** n. s. White. (1876.)
Rep. Geol. Uinta Mts., pp. 110, 111. Wash.,
1876. C. A. White.
Formation: Jurassic.
Location: Mouth of Thistle creek, Spanish fork
canyon, Utah.
- **volvilineata** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 131. Wash., 1876. C.
A. White.
Formation: Tertiary [Cretaceous].
Location: Black buttes, Wyo.
- **volvilineata** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 209. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Yampa valley, near Canyon park, Colo.

Neritina—Continued.

- **volvilineata** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 220. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black buttes station, Wyo.
- **volvilineata** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 88, 89, pl. 21, figs. 6a, b. Wash.,
1883. C. A. White.
Formation: Cretaceous.
Location: Black buttes station, Wyo.
- **volvilineata** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 23,
figs. 12, 13. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Black buttes, Wyo.
- (**dostia** ?) **bellatula** n. s. Meek.
(1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 497, 498. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- (**dostia** ?) **carditoides** n. s. Meek.
(1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 499. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- (**dostia** ?) **patelliformis** n. s. Meek.
(1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 498, 499. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Neritella**) **bannisteri** n. s. Meek.
(1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 499, 500. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- (**Neritella**) **pisum** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 500. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.
- (**Velatella**) **baptista** n. s. White.
(1878.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, pp. 715, 716. Wash., 1878. C. A. White.
Formation: Cretaceous.
Location: Black buttes station, Union Pacific rail-
road, Wyo.
- (**Velatella**) **baptista** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 220. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black buttes station, Wyo.

Neritina—Continued.

- (**Velatella**) **baptista** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 89, 90, pl. 29, figs. 6a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes station, Wyo.

- (**Velatella**) **baptista** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 23,
figs. 16-20. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

- (**Velatella**) **bellatula** (Meek) White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Velatella**) **bellatula** (Meek) White.
(1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 5,
figs. 8, 9. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Velatella**) **bellatula** (Meek) White.
(1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 27, 28, pl. 12, figs. 8a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, Coalville, Utah.

- (**Velatella**) **carditoides** (Meek)
White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of
one hundredth meridian, vol. 4, pt. 1, pp. 189,
190, pl. 18, figs. 7a-c. Wash., 1875. C. A.
White.

Formation: Cretaceous.

Location: South of Last bluff, Utah.

- (**Velatella**) **carditoides** (Meek)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Velatella**) **carditoides** (Meek)
White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 52, pl. 5,
fig. 10. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Velatella**) **carditoides** (Meek)
White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 28, 29, pl. 12, fig. 7a. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, Coalville, Utah.

- (**Velatella**) **patelliformis** (Meek)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Neritina—Continued.

- (**Velatella**) **patelliformis** (Meek)
White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 309, pl. 7, figs. 7a-d. Wash., 1879.

C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Nelatella**) **patelliformis** var. **web-**
erensis n. var. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- (**Velatella**) **patelliformis** var. **web-**
erensis White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 309, 310, pl. 7, figs. 8a, b. Wash.,
1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

- ? White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 62, pl. 10, fig. 12.
Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Palace camp, Wash.

- Neritopsis** (Gratel.) Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
598. St. Louis, 1856-1860. B. F. Shumard.

- **biangulatus** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
598. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Alexander's bend, Grayson county,
Tex.

- Neverita** (Risso) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 108. Phila.,
1864. W. M. Gabb.

- **globosa** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 161, pl. 27, fig.
39. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Ten miles west of Griswold's on the
road from San Juan to New Idria, and south-
east of the "Sheep well," Cal.

- **secta** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 108, 109, pl.
220, 220a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon, Cal.

- Niæa** (subgen. Swain) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash.,
1876. F. B. Meek.

- Niso** (Risso) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 116. Phila.,
1864. W. M. Gabb.

- **polita** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 116, pl. 21, fig.
113. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Northeast of Martinez, Cal.

Nodosaria (Lam.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur. vol. 1, pt. 2, p. 159. Wash., 1857. T. A. Conrad.

— **acus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 3. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **ampla** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 6. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **sulcata** nils. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 214. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Brownville and Turtle mill, N. J.

— **texana** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 159, pl. 14, figs 4a-c. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Between El Paso and Frontera.

— **tumescens** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 4. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **vulgaris** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 2. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **vulgaris** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 5. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **sp.** Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861. Band XLIV, p. 334. Wien., 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

— (d'Orb.) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861. Band XLIV, p. 334. Wien., 1862. A. E. Reuss.

Nucleolites (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 75. Phila., 1834. S. G. Morton.

— **crucifer** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294. New Haven, 1833. S. G. Morton.

Formation: [Cretaceous.]

Location: United States.

— **crucifer** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 75, pl. 3, fig. 15. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Nucleolites—Continued.— **crucifer** (Morton) Desor. (1858.)

Synop. Echinoides Foss., p. 262. Paris and Wiesbaden, 1858. E. Desor.

Formation: Cretaceous.

Location: New Jersey.

— **crucifer** (Morton) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 217, 218. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Brownville, N. J.

— **lyelli** (Couper MSS.) Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 40, pl. 1, fig. 14. Phila., 1850-1854. T. A. Conrad.

Formation: Tertiary [Cretaceous?].

Location: Baker county, Ga.

— **mortoni** (Couper MSS.) Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 40, pl. 1, fig. 11. Phila., 1850-1854. T. A. Conrad.

Formation: Tertiary [Cretaceous?].

Location: Palmyra, Lee county, Ga.

Nucula [Lam.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr., U. S., p. 65. Phila., 1834. S. G. Morton.

— (Lam. typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 98. Wash., 1876. F. B. Meek.

— **bellastriata** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 202, 203. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Red river bluffs, Fannin county, Tex.

— **bellastriata** (Shumard) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 38, pl. 18, figs. 5a-c. Wash., 1883. C. A. White.

— **cancellata** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 85. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— **cancellata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 102, 103, pl. 28, figs. 13a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Long lake, Deer creek, on the North Platte.

— **cancellata** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 181. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of the Cache à la Poudre, near Golden city, Colo.

— **cancellata** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Golden city, Colo.

Nucula—Continued.**— cancellata (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 37, 38. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: St. Mary river, eleven miles above its mouth, Canada.

— cancellata (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 79. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Milk river, at the mouth of Pa-Kow-Ki coulee and Milk river, four miles east of the crossing of MacLeod Benton trail, Canada.

— cuneifrons n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 281, pl. 46, fig. 33. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— distorta n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 396, 397, pl. 68, fig. 34. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Cut on the Memphis and Charleston R. R., where it crosses the Tennessee and Mississippi State line.

— eufalensis n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 397, pl. 68, fig. 35. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— equilateralis n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 84, 85. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— ermani (Gir.) Eichwald. (1871.)

Geogr. Paleont., Bemer. Halb. Mang. aleutischen Inseln, pp. 126, 127. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Atcha island, Alaska.

— evansi n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 84. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— haydeni n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 602, 603. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Fannin county, Tex.

— haydeni (Shumard) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 38, pl. 18, figs. 6a, b. Wash., 1883. C. A. White.

Nucula—Continued.**— monmouthensis n. s. Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, pp. 102, 103, pl. 11, fig. 1. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Marlboro and Haddonfield, N. J.

— obsoletastriata n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 275. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Great bend of the Missouri, Nebr.

— obsoletistriata (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 100, 101, pl. 15, figs. 10c, d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri.

— pectinata (?) (Sow.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 161, pl. 18, fig. 8. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Lower part of the Trent river.

— percrassa n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 327, pl. 35, fig. 4. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— percrassa (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 318. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— percrassa (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 102, pl. 11, figs. 4-6. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near Burlington, (?) N. J.

— perequalis n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 281. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— perequalis (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 104, 105. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey (?).

— planimarginata (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 101, 102, pl. 15, fig. 8a, b., pl. 28, fig. 16. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Long lake, Butte au Grès, etc.

Nucula—Continued.— **planimarginata** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 182. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of the Cache à la Poudre, the mouth of the Saint Vrain creek, and near Golden city, Colo.

— **planimarginata** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Golden city, Colo.

— **planimarginata** (M. & H.) White. (1869.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 206. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colo.

— **planimarginata** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 406, 407, pl. 11, figs. 5, 6. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, ten miles west of the mouth of Beaver creek, Black hills.

— **planomarginata** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 85. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— **scitula** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 84. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— **serrata** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 603. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Bluffs of Red river, Lamar county, Tex.

— **slackiana** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 318. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **slackiana** (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 103, 104, pl. 11, figs. 2, 3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schanck's pits, near Marlboro, N. J.

— **soltaria** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 197, pl. 32, fig. 94. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

Nucula—Continued.— **solitaria** (Gabb) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 232, 233, pl. 31, figs. 3, 3a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay.

— **subnasuta** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., pp. 384, 385, pl. 1, figs. 10, a-c. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek.

— **subplana** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 85. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above mouth, Nebr.

— **subplana** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 99, 100, pl. 17, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth.

— **traskana** n. s. Meek. [*1858.]

Trans. Albany Inst., vol. 4, p. 39. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **traskana** Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2. No. 4, p. 356. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **truncata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 198, 199, pl. 26, figs. 184, 184a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, Butte county; Tuscan springs, Tehama county; Ranch of San Luis Gonzaga, east of Pacheco pass, Martinez, Cal.

— **ventricosa** n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 385, pl. 1, figs. 11a, b. Cambridge and Boston, 1855.

Hall & Meek.

Formation: Cretaceous.

Location: Sage creek.

— (**Acila**) **truncata** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 197. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Almost every locality of the Chico, Martinez, and Tejon groups, Cal.

— (**Acila**) **truncata** (Gabb) Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, pp. 264, 265. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island.

*The date of this paper has been given by Meek as 1856 and 1857; by White as 1856, and by Marcou as 1857; 1858 is the earliest date of imprint on the volume.

Nucula—Continued.— (**Acila**) **truncata** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 162.
Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; Gabriola island; southwest side of Denman island; Nanaimo river, Vancouver island, two miles and a quarter up, and Protection island.

— (**Acila**) **truncata** (Gabb) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 232. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay and bay east of Alliford bay, in Skidegate inlet.

— **sp. undet.** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 292. New Haven, 1833. S. G. Morton.

Formation: [Cretaceous.]

Location: Near Bordentown, N. J.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 65. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Vicinity of Bordentown, N. J.

— **sp. undet.** Whiteaves. (1874.)

Geol. Sur. Can., Rep. Prog. for 1873-1874, p. 263. Montreal, 1874. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two and one-quarter and two and one-half miles up.

— **sp. undet.** Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, p. 73. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— ? **White.** (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

Nuculana (Link) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 103, 104, Wash., 1876. F. B. Meek.

— **bisulcata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 104, 105, pl. 15, fig. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Deer creek, near north branch of Platte river.

— **bisulcata** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 407, 408, pl. 11, fig. 7. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Boxelder creek, and on the east fork of Beaver creek, Black hills.

Nuculana—Continued.— **compressifrons** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 109, pl. 11, fig. 9. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— ? **equilateralis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 106, pl. 15, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **gabbana** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 106, 107, pl. 11, figs. 11-13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold, N. J.

— **inclara** n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4 No. 3, pp. 708, 709. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, near White River Indian agency, Colo.

— **inclara** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 212. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colo.

— **inclara** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 60, 61, pl. 25, fig. 7a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, near White River Indian agency, northwestern Colorado.

— **longifrons** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 107, 108, pl. 11, figs. 16, 17. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **pinnaformis** (Gabb) Whitfield. (1884.)

Mon. U. S. Geol. Sur., vol. 9, pp. 108, 109, pl. 11, figs. 7, 8. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **protecta** Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 318. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— **protecta** (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 105, 106, pl. 11, fig. 10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Crosswicks and Mullica hill, N. J.

— **subequilatera** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur., Rocky Mt. Region; Prelim. Rep. Paleont., Black Hills, p. 33. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near French creek.

Nuculana—Continued.— **subequilatera** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 408, pl. 11, figs. 3, 4. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near French creek, Black hills.

— **subnasuta** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 105, 106, pl. 15, fig. 9. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri, below Fort Pierre.

Nucularia n. g. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 44. Phila., 1870. T. A. Conrad.

— **papyria n. s.** Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 44, pl. 1, fig. 7. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **papyria** Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 98, pl. 9, fig. 25. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **papyria** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 111, 112, pl. 11, figs. 18-20. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

Nummulites Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 45. Phila., 1834. S. G. Morton.

— **mantelli n. s.** Morton. (1833.)

Am. Jour. Sci., 1st. ser., vol. 23, p. 291, pl. 5, fig. 9. New Haven, 1833. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Near Claiborne, Ala.

— **mantelli** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 45, 46, pl. 5, fig. 9. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Near Claiborne, Ala.

Obovaria (subgen. Raf.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Odontobasis ? n. g. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 351, 352. Wash., 1876. F. B. Meek.

— **buccinoidea n. s.** White. (1876.)

Rep. Geol. Uinta Mts., p. 124. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Two miles west of Point of Rocks, Wyo.

— **buccinoides** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bitter creek valley, two miles west of Point of Rocks station, Wyo.

Odontobasis—Continued.— **buccinoides** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 212. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Two miles west of Point of Rocks, Wyo.

— **buccinoides** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 102, 103, pl. 20, figs. 3a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Two miles west of Point of Rocks station, Wyo.

— **constricta** (H. & M. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 352-354, figs. 41, 42, p. 353. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Deer creek, on the north branch of Platte river.

— **? formosa n. s.** White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, pp. 718, 719. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, northwestern Colorado.

— **? formosa** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 213. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colo.

— **? formosa** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 103, pl. 28, fig. 7a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, near White river Indian agency, northwestern Colorado.

— **ventriosa n. s.** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 354, pl. 19, figs. 1a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cherry creek, near the mouth of Sage creek, Dak.

Oene n. g. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 9. T. A. Conrad.

— **plana n. s.** Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 9, pl. 1, fig. 17. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Olcostephanus quatsinoensis n. s. Whiteaves. (1882.)

Proc. and Trans. Roy. Soc. Can., vol. 1, sec. 4, p. 82, fig. 1. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: Forward inlet, Quatsino sound, Canada.

— **loganianus** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 211, 212, pl. 23, figs. 1, 1a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay, in Skidegate inlet.

Oligoptych[a] subgen. Meek. (1876.)

Rep. U. S. Geol. Terr., vol. 9, p. 283. Wash., 1876. F. B. Meek.

Olivella (Swains) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 100. Phila., 1864. W. M. Gabb.

— mathewsonii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 100, pl. 18, fig. 53. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Northeast of Martinez; also at Alizos creek, near Fort Tejon, Cal.

Omphalophacus? tenellus Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 34. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Omphiscola (subgen. Raf.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 533. Wash., 1876. F. B. Meek.

Ophioderma White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 8. Wash., 1883. C. A. White.

— ? bridgerensis (Meek) White. (1882.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 8, 9, pl. 12, fig. 12a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: "Last foot of Bridge peak, four miles north of Fort Ellis, Mont."

Opis (Defr.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 327. Phila., 1855-1858. T. A. Conrad.

— (Defr.?) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 311. Phila., 1876. W. M. Gabb.

— bella n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 327. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— bicarinata n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser. 1855-1858, p. 327. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— conradi Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 311. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

— vancouverensis n. s. Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 158-160, pl. 18, figs. 4, 4a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Southwest side of Denman island.

Opis—Continued.**— vancouverensis Whiteaves. (1887.)**

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886, App. I, p. 112 B. Montreal, 1887. J. F. Whiteaves.

Formation: Cretaceous.

Location: West end of Lasqueti island (in the strait of Georgia) near False bay.

— vancouverensis Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 155. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: West end of Lasqueti island (in the strait of Georgia) near False bay.

Orbitulites texanus n. s. Roemer. (1849.)

Tex. p. 392. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: On road from New Braunfels to Fredericksburg, Tex.

— texanus Roemer. (1852.)

Kreide von Tex. p. 86, Taf. 10, figs. 7a-d. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Wasp creek, on road from New Braunfels to Fredericksburg, and upper course of the Pedernales river, Tex.

Orthoceras (Brug.) Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 6. Phila., 1870. W. M. Gabb.

— blakei Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 6. Phila., 1870. W. M. Gabb.

Formation: Triassic.

Location: Nevada.

— blakei (Gabb?) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 104, 105, pl. 10, fig. 11. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Ridge above Cottonwood canyon, West Humboldt range.

Orthoceratites (Brey.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 19. Phila., 1864. W. M. Gabb.

— blakei n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 19, pl. 3, fig. 1. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Buena Vista district, Humboldt mining region.

Ostrea [Linn.] Say. 1820.

Am. Jour. Sci., 1st ser., vol. 2, p. 42. New Haven, 1820. Thomas Say.

— acuticosta n. s. N. & G. (1840.)

Bull. Roy. Acad. Sci. Bruxelles, Tome 7, pt. 2, pp. 213, 214, fig. 2. Bruxelles, 1840. Nyst & Galeotti.

Formation: Jurassic.

Location: Tehuacan, Mexico.

Ostrea—Continued.**— acutirostris (Nilsson) Troost. (1840.)**

Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840.
G. Troost.

Formation: Cretaceous.

Location: McNairy county, Tenn.

— acutirostris (Nils.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 227.
Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Near Woodbury, N. J.

— acutirostris (Nils.) n. var. Eichwald. (1871.)

Geogr.-Paleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 134, 135. St. Petersburg, 1871.
E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula.

— americana (Deshayes) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 291. Wash., 1884. C. A. White.

Formation: Cretaceous.

— anomieformis n. s. Roemer. (1849.)

Tex. p. 394. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford and waterfall near New Braunfels, Tex.

— anomieformis Roemer. (1852.)

Kreide von Tex. p. 75, Taf. 9, figs. 7a-d. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford and waterfall of the Guadalupe near New Braunfels, Tex.

— anomieformis (Roemer) Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, p. 31, pl. 4, figs. 9-13. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: New Braunfels, Tex.

— anomieformis (Roemer) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 291. Wash., 1884. C. A. White.

Formation: Cretaceous.

— anomioides n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 488. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Missouri river, below Gallatin city, Mont.

— anomioides (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 10, 11, pl. 11, figs. 4, a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Missouri river, below Gallatin city, Mont.

Ostrea—Continued.**— anomioides (Meek) White. (1884.)**

Fourth Ann. Rep. U. S. Geol. Sur., p. 291, pl. 39, figs. 4, 5. Wash., 1884. C. A. White.

Formation: Cretaceous.

— appressa n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 203, 204, pl. 34, fig. 104, 104a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: One of the branches of Eel river, at the mouth of Salt creek, southwest of Round valley, Mendocino county, Cal.

— appressa (Gabb) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., pp. 291, 292, pl. 39, fig. 9. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: California.

— arietina (d'Orb.) Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, p. 42, pl. 5, figs. 10-13. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: Waco camp, Mission hills, New Braunfels, and Leon springs, Tex.

— barrandei n. s. Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, p. 47, pl. 12, figs. 1-4. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: New Jersey.

— barrandei (Coquand) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., pp. 292, 293, pl. 44, figs. 1, 2; pl. 45, fig. 2, pl. 46, fig. 1. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: New Jersey?

— bella n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 156, pl. 10, figs. 4a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Western Texas.

— bella (Con.) Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, p. 61, pl. 32, figs. 7, 8. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: Canada, Texas, and Mexico.

— bella (Con.) White. (1884)

Fourth Ann. Rep. U. S. Geol. Sur., p. 292, pl. 39, fig. 6. Wash., 1884. C. A. White.

Formation: Cretaceous.

— bellaplicata n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 608, 609, St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Near Sherman, in the bluffs of Post Oak creek, and various other localities in Grayson county, Tex.

— belliplicata (Shum.) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 292, pl. 47, figs. 1-3. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Texas.

Ostrea—Continued.**— (Alectryonia) belliplicata (Shum.) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 276, 277, pl. 4, figs. 3a,b; pl. 8, figs. 2a,b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Sherman, in the bluffs of Post Oak creek, and various other localities in Grayson county (Tex.), Denison, Tex.

— bellarugosa (Shum.) White. (1883.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 292. Wash., 1884. C. A. White.

Formation: Cretaceous.

— blackii White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 292, pl. 45, fig. 1; pl. 46, fig. 2. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Texas.

— brewerii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 204, pl. 26, fig. 191. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cow creek, Shasta county, Cal.

— brewerii (Gabb) Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, pp. 61, 62, pl. 32, fig. 10. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: Cow creek, Shasta county, Cal.

— brewerii (Gabb) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 293. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: California.

— bryani n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 321, Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Near Vincenttown, N. J.

— bryani (Gabb) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 293. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: New Jersey.

— carinata (Lam.) Roemer. (1849.)

Tex., p. 394, Bonn., 1849. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, near New Braunfels, Tex.

— carinata (Lam.) Roemer. (1852.)

Kreide von Tex., p. 75, Taf. 9, fig. 5. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, on the Guadalupe above New Braunfels, Tex.

— carinata (Lam.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 156, pl. 10, fig. 6. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Turkey creek; Las Minas, New Braunfels.

Ostrea—Continued.**— carinata (Lam.) (Roemer.) White. (1884.)**

Fourth Ann. Rep. U. S. Geol. Sur., p. 293, pl. 43, figs. 1-4. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Texas.

— coalvillensis (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 233. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— coalvillensis (Meek) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 293, pl. 36, figs. 1-4. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— confragosa n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 329, pl. 34, fig. 4. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— confragosa (Con.) White. (1884.)

Fourth Ann. Rep. U. S. Geol. Sur., p. 293. Wash., 1884. C. A. White.

Formation: Cretaceous.

Location: Mississippi.

— congesta n. s. Conrad. (1843.)

Rep. Hydrog. Basin Upper Mississippi river, I. N. Nicollet. App. C, p. 169. Wash., 1843. T. A. Conrad.

Formation: Cretaceous.

Location: On the Missouri river.

— congesta (Con.) Hall. (1856.)

Rep. Expl. and Sur. R. R. R. Mississippi river to Pacific ocean, vol. 3, pt. 4, p. 100, pl. 1, fig. 11. Wash., 1856. James Hall.

Formation: Cretaceous.

Location: Three miles north of Galisteo; from marls on the Missouri; Missouri river, twenty-six miles above the mouth of l'Eau qui Court.

— congesta (Con.) Coquand. (1869.)

Monog. Genre Ostrea Terrain Crétacé, p. 49, pl. 17, fig. 5. Marseilles, 1869. H. Coquand.

Formation: Cretaceous.

Location: Arkansas, New Mexico, and on the Missouri.

— congesta (Con.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 13, 14, pl. 9, figs. 1a-f. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: At numerous places along the Missouri between the Big Sioux and the Great bend; also on Little Blue river, near the Kansas and Nebraska line, and near the Black hills, on Cheyenne river, as well as on the North Platte, in the Niobrara group. It likewise occurs at several localities in New Mexico and Colorado.

Ostrea—Continued.

- **congesta** (Conrad) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- **congesta** (Conrad.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 233, 234, Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **congesta** (Con.) White. 1884.
Fourth Ann. Rep. U. S. Geol. Sur., p. 294, pl. 39,
figs. 11, 13. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **congesta** (Con.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 78, 79. Montreal, 1885. J.
F. Whiteaves.
Formation: Cretaceous.
Location: Rocky Spring ridge, near MacLeod
Benton trail; west flank of West butte, in the
Sweet Grass hills, and close to the international
boundary line.
- **congesta** (Con.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 83. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Waterton river, a few miles below the
lake, Canada.
- **congesta** (Con.) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 2, pp. 186, 187. Montreal, 1889.
J. F. Whiteaves.
Formation: Cretaceous.
Location: Swan river; Ocre river, township 23,
range 17, west; and township 22 in the same
range; Vermilion river, township 24, range 17,
west; and township 25 in the same range; Roll-
ing river, two miles above the old C. P. R.
crossing, and Swan river, township 35, range 29,
west; Thunder hill, township 35, range 30,
west; Assiniboine river, section 36, township 8,
range 11, west, Manitoba.
- **convexa** n. s. Say. (1820.)
Am. Jour. Sci., 1st ser., vol. 2, pp. 42, 43. New
Haven, 1820. Thomas Say.
Formation: [Cretaceous.]
Location: Near Burlington, N. J., and at Mullica
hill, same State.
- **convexa** (Say) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 294. Wash.,
1884. C. A. White.
Formation: Cretaceous.
- **cortex** (Con.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 64, 65,
pl. 34, figs. 11-14. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Dry creek, Mexico.

Ostrea—Continued.

- **cortex** (Con.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, p. 170, pl. 15,
figs. 2a-c. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Colob plateau, southwest of Kanara,
and also at the North fork of Virgin river, Utah.
- **cortex** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 294, pl. 37,
figs. 3, 4. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Dry creek, Mexico.
- **crenulata** (Tuomey) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 294. Wash.,
1884. C. A. White.
Formation: Cretaceous.
- **crenulimarginata** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 398, pl. 68, figs. 40, 41. Phila., 1858-
1860. W. M. Gabb.
Formation: Cretaceous.
Location: Two miles east of Middleton, Tenn.
- **crenulimarginata** (Gabb) Coquand.
(1869.)
Mono. Genre Ostrea Terrain Crétacé, p. 51, pl.
17, figs. 12, 13. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Tennessee.
- **crenulimarginata** (Gabb) White.
(1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 294, pl. 40,
fig. 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Tennessee.
- **crenulimarginata** (Gabb) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 30, pl. 3, figs.
10, 11. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Marlboro, N. J.
- **crenulimargo** n. s. Roemer. (1852.)
Kreide von Tex., p. 76, Taf. 9, figs. 6a, b. Bonn,
1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **crenulimargo** (Roemer) Coquand.
(1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 55, 56,
pl. 25, figs. 7, 8. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **crenulimargo** (Roemer) White.
(1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 294, pl. 33,
figs. 8, 9. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.

Ostrea—Continued.

- **cretacea n. s. Morton.** (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 52, pl. 19,
 fig. 3. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Erie, Greene county, Ala.; South Caro-
 lina.
 The South Carolina specimen is probably Tertiary,
 but the Alabama specimen is undoubtedly Cretaceous.
- **cretacea (Mort.) Owen.** (1860.)
 Second Rep. Geol. Rec. Ark., pl. 8, fig. 8. Phila.,
 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **cretacea? (Mort.) Owen.** (1860.)
 Second Rep. Geol. Rec. Ark., pl. 7, fig. 7. Phila.,
 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **cretacea (Mort.) Owen.** (1860.)
 Second Rep. Geol. Rec. Ark., pl. 7, figs. 3a, b.
 Phila., 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **cretacea (Morton) Gabb.** (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 328.
 Phila., 1862. W. M. Gabb.
 Formation: Cretaceous.
 Location: Mullica hill, N. J.
- **cretacea (Morton) Coquand.** (1869.)
 Monog. Genre Ostrea Terrian Crétacé, p. 52, pl.
 23, figs. 4, 5. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Greene county, and Prairie bluff, Ala.;
 Erie, Ark.
- **cretacea (Morton) White.** (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., pp. 294, 295.
 Wash., 1884. C. A. White.
 Formation: Cretaceous.
 Location: Arkansas.
- **cristagalli? [Schlot.] Morton.**
 (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 284. New
 Haven, 1830. S. G. Morton.
 Formation: [Cretaceous.]
 Location: [St. Georges, Del.]
- **cristagalli? [Schlot.] Morton.**
 (1830.)
 Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 22.
 New Haven, 1830. S. G. Morton.
- **denticulifera n. s. Conrad.** (1858.)
 Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser.,
 1855-1858, p. 330, pl. 34, figs. 1, 8. Phila., 1855-
 1858. T. A. Conrad.
 Formation: Cretaceous.
 Location: Owl creek, three miles north of the
 town of Ripley, Miss.
- **denticulifera (Con.) Coquand.**
 (1869.)
 Monog. Genre Ostrea Terrain Crétacé, p. 50, pl.
 17, figs. 8, 9. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Alabama, Missouri, and Tennessee.

Ostrea—Continued.

- **denticulifera (Con.) White.** (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 295.
 Wash., 1884. C. A. White.
 Formation: Cretaceous.
 Location: Mississippi.
- **denticulifera (Con.) Whitfield.**
 (1885.)
 Mon. U. S. Geol. Sur., vol. 9, p. 29, pl. 3, figs. 8, 9.
 Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Haddonfield, N. J.
- **diluviana (Linn.) White.** (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 295, pl.
 40, fig. 1, pl. 41, figs. 1, 2. Wash., 1884. C.
 A. White.
 Formation: Cretaceous.
 Location: Bell county, Tex.
- **elegantula (Newberry) White.**
 (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 295, pl. 36,
 figs. 5-7. Wash., 1884. C. A. White.
 Formation: Cretaceous.
 Location: Valley of Canadian river.
- **engelmanni n. s. Meek.** (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, p. 311.
 Phila., 1861. F. B. Meek.
 Formation: Jurassic.
 Location: Red buttes, on the North Platte, lati-
 tude 42° 50', longitude 106° 40' west.
- **engelmanni Meek.** (1876.)
 Rep. Expl. Great Basin Terr., Utah, pp. 355, 356,
 pl. 3, fig. 6. Wash., 1876. F. B. Meek.
 Formation: Jurassic.
 Location: Red buttes, on the North Platte, lati-
 tude 42° 50', longitude 106° 40' west.
- **engelmanni (Meek) M. & H.**
 (1865.)
 Paleont. Up. Missouri, Smithsonian. Cont. Knowl.,
 vol. 14, No. 172, pp. 73, 74, figs. A and B.
 Wash., 1865. Meek & Hayden.
 Formation: Jurassic.
 Location: Red buttes, on north branch of Platte
 river, Dak. Ter., latitude 42° 50', longitude 106°
 40' west.
- **engelmanni (Meek) White.** (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 289, pl.
 34, figs. 3, 4. Wash., 1884. C. A. White.
 Formation: Jurassic.
 Location: Eastern portion of Wyoming.
- **exogyrella n. s. Gabb.** (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, pp. 322, 323.
 Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Pataula creek and Georgetown, Ga.
- **exogyrella (Gabb) White.** (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 296. Wash.,
 1884. C. A. White.
 Formation: Cretaceous.
 Location: Georgia.

Ostrea—Continued.

- **falcata** n. s. Morton. (1827.)
 Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 50, 51, pl. 1, fig. 2. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
 Location: Delaware and Chesapeake canal, near St. Georges.
- **falcata** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 284. New Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: St. Georges, Delaware; many parts of New Jersey.
- **falcata** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 18, pl. 3, figs. 19, 20. New Haven, 1830. S. G. Morton.
- **falcata** Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., pp. 50, 51, pl. 3, fig. 5; pl. 9, figs. 6, 7. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: St. Georges, Del.; Catawba, Ala.; Prairie bluff, on the Alabama river; Shrewsbury, N. J.
- **falcata** ? (Mort.) Troost. (1840.)
 Fifth Geol. Rep. Tenn., pp. 45, 46. Nashville, 1840. G. Troost.
 Formation: Cretaceous.
 Location: Near Purdy, McNairy county, Tenn.
- **falcata** (Mort.) Owen. (1860.)
 Second Rep. Geol. Rec. Ark., pl. 7, fig. 5. Phila., 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **falcata** (Morton) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 296. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **falcata** var. **mesenterica** n. var. Morton. (1833.)
 Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 7. New Haven, 1833. S. G. Morton.
- **falcata** var. **nasuta** n. var. Morton. (1833.)
 Am. Jour. Sci., 1st ser., vol. 24, pl. 9, fig. 6. New Haven, 1833. S. G. Morton.
- **ferdinandi** n. s. Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, pp. 33, 34, pl. 5, figs. 14, 15. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Leon springs and New Braunfels, Tex.
- **flabellula** (Lam.) Troost. (1840.)
 Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840, G. Troost.
 Formation: Cretaceous.
 Location: McNairy county, Tenn.
- **fragosa** (Con. sp.) Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, p. 53, pl. 23, figs. 6, 7. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Between El Paso and Frontera, Tex.

Ostrea—Continued.

- **franklini** n. s. Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, p. 53, pl. 23, figs. 8-10. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Arkansas.
- **franklini** (Coquand) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 296, pl. 39, figs. 1-3. Wash., 1884. C. A. White.
 Formation: Cretaceous.
 Location: Arkansas.
- **franklini** (Coquand) Hill. (1888.)
 Ann. Rep. Geol. Sur. Ark., for 1888, vol. 2, pp. 131-133, pl. 5, figs. 1-18a; pl. 6, figs. 19-25; pl. 7, figs. 28-30. Little Rock, 1888. R. T. Hill.
 Formation: Cretaceous.
 Location: Vicinity of Murfreesboro, Pike county, Ark., junction of Little Missouri river and the Muddy fork.
- **gabbana** n. s. M. & H. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 440. Phila., 1862. Meek & Hayden.
 Formation: Cretaceous.
 Location: Head of Gros Ventre river, Nebr.
- **gabbana** (M. & H.) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 296. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **glabra** n. s. M. & H. (1857.)
 Proc. Acad. Nat. Sci., Phila. for 1857, pp. 146, 147. Phila., 1858. Meek & Hayden.
 Formation: Cretaceous.
 Location: Mouth of Judith river, Nebr.
- **glabra** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 509, 510, pl. 40, figs. 2a-d. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Mouth of Judith river, Mont.
- **glabra** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 167, 168. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Crow creek valley, Colo.
- **glabra** (Meek) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 190. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Valley of Bijou creek, Colo.
- **glabra** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 208. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Yampa valley near Canyon park, Colo.
- **glabra** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Rock springs, Wyo.

Ostrea—Continued.

- *glabra* (M. & H.?) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 215. Wash., 1879. C. A. White.
Formation: Cretaceous.

Location: Bitter creek valley, two miles west of
Point of Rocks station, Wyo.

- *glabra* (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 216. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks station, Wyo.

- *glabra* (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 217, 218. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks and Black buttes station,
Wyo.; eastern Colorado, Bear river valley.

- *glabra* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 15, pl. 10,
figs. 1-5. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of the South Platte, Colo.

- *glabra* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 15, pl. 11,
figs. 1-4. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks, Wyo.

- *glabra* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 15, pl. 12,
fig. 1. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Point of Rocks, Wyo.

- *glabra* (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 56. Wash., 1883. C. A. White.
Formation: Cretaceous.

- *glabra* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 15, pl. 9,
figs. 1-4. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Valley of the South Platte, Colo.

- *glabra* (M. & H.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 307, 308,
pls. 58-60. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.

- *glabra* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont., Can. Pale-
ont., vol. 1, p. 64. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.
Location: South Saskatchewan, one mile below
the mouth of the Bow river; also South Sas-
katchewan, six miles below the mouth of the
Bow river, and north bank of the Milk river,
five miles below Pa-Kow-Ki coulee, and south
bank of Milk river, above Pa-Kow-Ki coulee,
Canada.

Ostrea—Continued.

- *glabra* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 56. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Near Bull's head; Saskatchewan coal
mines, near Medicine hat, Canada.

- *glabra* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 5. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Bow river, mouth of East Arrowwood
creek; Upper Belly river, twenty-three miles
above the mouth of the Waterton; forks of
Devil's Pine and Three Hills creeks; also Red
Deer river, near eighth correction line; Oyster
creek, northwest branch of the north fork of
the Old Man river.

- *glandiformis* n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 205, 206, pl. 27,
figs. 1-5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.

Location: Farmingdale; Squankum; Shark river,
near New Egypt; near Vincentown, N. J.

- *idraensis* n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 203, pl. 33, figs.
103, b-d; pl. 34, figs. 103, 103a. Phila., 1869. W.
M. Gabb.

Formation: Cretaceous.

Location: About two miles east of the Hacienda
at New Idria, Cal.

- *idriaensis* (Gabb?) Meek. (1872.)
Fifth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
p. 375. Wash., 1872. F. B. Meek.
Formation: Cretaceous.
Location: Point of Rocks, Wyo.

- *idriaensis* (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 296, pl. 34,
figs. 7, 8. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: California.

- *inornata* n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 181, 182.
Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Great bend of the Missouri, below Fort
Pierre, Nebr.

- *inornata* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 14, pl. 10, fig. 4.
Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri, below Fort
Pierre.

- *inornata* (Meek) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 296. Wash.,
1884. C. A. White.
Formation: Cretaceous.

Ostrea—Continued.

- **inornata** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, p. 30. Montreal, 1885. J. F. White-
aves.

Formation: Cretaceous.

Location: St. Mary river, near its confluence with
the Belly river, Canada.

- **insecura** n. s. White. (1876.)
Rep. Geol. Uinta Mts., pp. 112, 113. Wash., 1876.
C. A. White.
Formation: Cretaceous.
Location: Two miles west of Point of Rocks,
Wyo.

- **larva** (Lam.) Troost. (1840.)
Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G.
Troost.
Formation: Cretaceous.
Location: McNairy county, Tenn.

- **larva** (Lam.) Cook. (1868.)
Ann. Rep. Geol. Sur., New Jersey, for 1868, p. 375.
fig. on, p. 375. Newark, 1868. G. H. Cook.
Formation: Cretaceous.
Location: New Jersey.

- **larva** (Lam.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 226, 227.
Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Woodbury, Marlboro, Nutswamp, N. J.

- **larva** (Lam.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 320.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Georgetown, Quitman county, Ga.

- **larva** (Lam.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 34-36, pl. 3, figs.
3-7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Throughout New Jersey.

- **larva** (Lam.) Hill. (1889.)
Geol. Sur. Tex., Bull. No. 4, p. 6. Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: Manor, Travis county, Tex.

- **lateralis** (Nilsson) Troost. (1840.)
Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G.
Troost.
Formation: Cretaceous.
Location: McNairy county, Tenn.

- **lateralis** (Nils. sp.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 228.
Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Eatontown and Timber creek, N. J.

- **lateralis** (Nilsson) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297. Wash.,
1884. C. A. White.
Formation: Cretaceous.

Ostrea—Continued.

- **littlei** n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 321,
322. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek and Georgetown, Ga.

- **littlei** (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297. Wash.,
1884. C. A. White.
Formation: Cretaceous.
Location: Georgia.

- **lugubris** n. s. Conrad. (1857.)
Rep. U. S. Mex. Bound. Sur., vol. 1, pt. 2, p. 156, pl.
10, fig. 5. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: East of Red river (Canadian), N. Mex.,
Santa Fe road.

- **lugubris** (Con.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 66, pl.
36, figs. 22, 23. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Texas, east of Red river; and New
Mexico.

- **lugubris** (Con.) Meek. (1876.)
Rep. Expl. Exped. Santa Fe, N. Mex., to junction,
of Grand and Green rivers, pp. 123, 124, pl. 1,
figs. 1a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Banks of the Canadian, Va do del
Chama, Galisteo, Pagosa, N. Mex.

- **lugubris** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297, pl. 41,
fig. 3. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Colorado and New Mexico.

- **lunata** (Nils.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, p. 227.
Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: Near Eatontown, N. J.

- **lyoni** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862,
pp. 200, 201. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Pine bluff, Red river county, Tex.

- **lyoni** (Shum.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297. Wash.,
1884. C. A. White.
Formation: Cretaceous.
Location: Texas.

- **malleiformis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 204, pl. 31, fig.
272. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Siskiyou mountains, in California and
Oregon; Jacksonville, Oregon.

- **malleiformis** (Gabb) Coquand.
(1869.)
Monog. Genre Ostrea Terrian Crétacé, p. 60, pl.
32, fig. 4. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Siskiyou mountains, Jacksonville, Ore-
gon; and California.

Ostrea—Continued.

- **malleiformis** (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297, pl. 50, fig. 7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: California.
- **marshii** (Sow.) Marcou. (1858.)
Geol. N. Am., pp. 43, 44, pl. 4, fig. 4. Zurich, 1858. Jules Marcou.
Formation: Jurassic [Cretaceous?].
Location: Pyramid mount.
- **mesenterica** (Mort.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **mortoni** (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 297. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **multilirata** (Con.) Coquand. (1869.)
Monog. Genre Ostrea Terrian Crétacé, p. 63, pl. 33, figs. 1-4. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Dry creek, Mexico; and Texas.
- **multiradiata** (Con.) White. (1883.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298, pl. 33, figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **nasuta** (Mort.) White. (1883.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **owenana** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 200. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Chatfield Point, Navarro county, Tex.
- **owenana** (Shum.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **panda** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293. New Haven, 1833. S. G. Morton.
Formation: [Cretaceous].
Location: New Jersey.
- **panda** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 51, 52, pl. 3, fig. 6; pl. 19, fig. 10. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: St. Georges, Del.; South Carolina; Alabama.
- **panda** (Morton) Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, pp. 328, 329. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Tennessee.

Ostrea—Continued.

- **panda** (Morton) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 57, 58, pl. 30, figs. 8, 9. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Jersey and Alabama.
- **panda** (Mort.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **panda** (Mort.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, p. 30. Wash., 1885. R. P. Whitfield.
Formation: Tertiary [Cretaceous?].
- **pandæformis** n. s. Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 328. Phila., 1862. W. M. Gabb.
Formation: Cretaceous?
Location: "Seven miles below Yazoo," Miss.
- **pandæformis** (Gabb.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Mississippi.
- **patina** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 277. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Two hundred miles above the mouth of Milk river, Nebr.
- (**Gryphæa** ?) **patina** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 16-18, pl. 10, figs. 2a, b., (bis.) and 3e, f; also pl. 11 (varieties). Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Two hundred miles above the mouth of Milk river on the Missouri.
- **patina** (M. & H.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 180. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, Colo.
- **patina** (M. & H.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298, pl. 47, figs. 4-6. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **patina** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 30. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: White Mud river (sometimes called Frenchman's creek), near the forty-ninth parallel and south of Woody mountain, Canada.
- **pellucida** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 15, pl. 28, figs. 4a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Long lake and Moreau river.

Ostrea--Continued.

- **pellucida** (M. & H.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 299, pl. 50,
figs. 6, 7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **pectinata** (Lam.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 76-79, pl.
29, figs. 1-7. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Turkey creek, Las Minas, and New
Braunfels, Tex.
- **peculiaris** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 329, pl. 34, fig. 7. Phila., 1855-1858. T.
A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.
- **peculiaris** (Con.) Coquand. (1896.)
Monog. Genre Ostrea Terrain Crétacé, pp. 49, 50,
pl. 17, figs. 6, 7. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Alabama.
- **peculiaris** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 298. Wash.,
1884. C. A. White.
Formation: Cretaceous.
Location: Mississippi.
- **pitcheri** [Morton sp.] Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 40, pl. 9,
figs. 9-12; pl. 12, figs. 5, 6. Marseilles, 1869. H.
Coquand.
Formation: Cretaceous.
Location: New Braunfels, Leon springs, and Cross
timbers, Tex., Fort Washita, Preston, and in
Arkansas and New Mexico.
- **planovata** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 201.
Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Navarro county, near Dresden, Tex.
- **planovata** (Shum.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 299. Wash.,
1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **plumosa** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293. New Haven,
1833. S. G. Morton.
Formation: [Cretaceous].
Location: New Jersey.
- **plumosa** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 51, pl. 3,
fig. 9. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Arnetown, N. J.
- **plumosa** (Morton) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 61, pl.
32, fig. 9. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Jersey, Alabama, and Missouri.

Ostrea—Continued.

- **plumosa** (Morton) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 299, pl.
37, figs. 5, 6. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: New Jersey.
- **plumosa** (Morton) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 31, 32, pl. 3,
figs. 12, 13. Wash., 1885. B. P. Whitfield.
Formation: Cretaceous.
Location: Arnetown, N. J.
- **prudentia** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one
hundredth meridian, vol. 4, pt. 1, p. 171, pl. 14,
figs. 2a-d. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: East of Impracticable ridge, Utah.
- **prudentia** White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 299, pl. 40,
figs. 5, 6. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Southern Utah.
- **pusilla** (Nils.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 321.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Georgetown, Pataula creek, and five
miles north of Lumpkin, Stewart county, Ga.
- **quadriplicata** n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
608. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Upper part of the bluffs of Red river,
Lamar county, and ten miles above the mouth
of Kiamesha creek, Tex.
- **quadriplicata** (Shumard) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 275, 276, pl. 5, fig. 6a; pl. 8, figs.
3a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bluffs of Red river, Lamar county, Tex.;
Denison, Tex.
- **quadriplicata** (Shumard) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 299, 300,
pl. 43, figs. 5-7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Texas.
- **radians** (Conrad) Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, p. 130. New
Haven, 1833. S. G. Morton.
Formation: Cretaceous [Tertiary?].
Location: Southern States.
- **robusta** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2,
pp. 156, 157, pl. 11, figs. 3a, b. Wash., 1857.
T. A. Conrad.
Formation: Cretaceous [Tertiary].
Location: * Jacun, three miles below Laredo.

* Mistake. This locality is Tertiary.

Ostrea—Continued.

- **robusta** (Conrad) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 62, pl. 32, figs. 11, 12. Marseilles, 1869. H. Coquand.
Formation: Cretaceous [Tertiary].
Location: * Jacun, three miles from Laredo, Tex.
- **robusta** (Conrad). (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 300, pl. 40, figs. 3, 4. Wash., 1884. C. A. White.
Formation: Cretaceous [Tertiary].
Location: Near Laredo, Tex. [?]
- **sandalina** (Goldf.) Troost. (1840.)
Fifth Geol. Rep. Tenn., p. 46. Nashville, 1840. G. Troost.
Formation: Cretaceous.
Location: McNairy county, Tenn.
- **sellæformis** (Conrad) Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24. New Haven, 1833. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: Southern States.
- **sellæformis** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 52. Phila., 1834. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: Alabama and South Carolina.
- **serrata** (Defr.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 79, 80, pl. 17, fig. 3; pl. 30, fig. 1-5. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Jersey.
- **similis** n. s. N. & G. (1840.)
Bull. Roy. Acad. Sci. Bruxelles, Tome 7, pt. 2, p. 214, fig. 5. Bruxelles, 1840. Nyst & Galeotti.
Formation: Jurassic.
Location: Tehuacan, Mexico.
- **skidegatensis** nom. prov. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mess. Foss., vol. 1, pt. 2, pp. 243, 244, pl. 32, fig. 1; pl. 12, p. 242. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: Skidegate inlet, south side of Alliford bay; Skidegate inlet, west side of Alliford bay.
- **skidegatensis** Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 165. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.
- **soleniscus** n. s. Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 430. Phila., 1871. F. B. Meek.
Formation: Tertiary [Cretaceous].
Location: With coal-bed, Bear River city.

Ostrea—Continued.

- **soleniscus** Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 487, 488. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Near Coalville, Utah; Bear River city, Wyo.
- **soleniscus** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 233. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **soleniscus** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 249. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Hilliard station, Wyo.
- **soleniscus** (Meek) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 9, 10. pl. 11, figs. 2a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Coalville, Utah; Bear River city, Wyo.; a few miles east of Bear River city, Wyo.
- **soleniscus** (Meek) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 300, pl. 42, fig. 1. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Southern Wyoming and adjacent parts of Utah and Colorado.
- **strigilecula** n. s. White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 163, 164, pl. 13, figs. 3a, d. Wash., 1875. C. A. White.
Formation: Jurassic.
Location: Two miles south of Dirty Devil river, Utah.
- **strigilecula** (White) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 348, 349, pl. 3, figs. 8, 12. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: East of the Belle Fourche river; Sundance hill, and near Beaver creek, Black hills.
- **strigilecula** White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 289, 290, pl. 35, figs. 9, 11. Wash., 1884. C. A. White.
Formation: Jurassic.
Location: Wyoming, Colorado, Utah, Idaho.
- **subalata** (Meek) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 300, pl. 39, fig. 10. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **subovata** n. s. Shumard. (1853.)
Expl. Red River, La., by R. B. Marcy, pp. 205, 206, pl. 5, fig. 2. Wash., 1853. B. F. Shumard.
Formation: Cretaceous.
Location: Fort Washita, Ind. Terr.

* Mistake. This locality is Tertiary.

Ostrea—Continued.

- **subovata** (Shum.) Coquand. (1869.)
Monog. Genre *Ostrea* Terrain Crétacé, pp. 48, 49,
pl. 17, fig. 4. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Texas, Arkansas, and Fort Washita.
- **subovata** (Shum.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 301. Wash.,
1884. C. A. White.
Formation: Cretaceous.
- **subfimbriata n. s.** Coquand. (1869.)
Monog. Genre *Ostrea* Terrain Crétacé, p. 60, pl.
32, figs. 5, 6. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Texas.
- **subspatulata n. s.** Forbes. (1844.)
Quart. Jour. Geol. Soc. London, vol. 1, pp. 61,
62, figs. on pp. 61, 62. London, 1845. Edward
Forbes.
Formation: Cretaceous.
Location: Lewis creek; south Washington; North
Carolina.
- **subspatulata** (Lyell Sow.) Conrad.
(1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1. pt. 2, pp.
155, 156, pl. 10, figs. 3a, b. Wash., 1857. T. A.
Conrad.
Formation: Cretaceous.
Location: Western Texas.
- **subspatulata** (Sow.) Coquand.
(1869.)
Monog. Genre *Ostrea* Terrain Crétacé, p. 43, pl.
15, fig. 3. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Lewis creek; North Carolina; Texas
Alabama; New Jersey; and Missouri.
- **subspatulata** (Fbs.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 320.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Five miles north of Lumpkin, Stewart
county, and near Fort Gaines, Ga.
- **subspatulata** (Forbes) White.
(1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 301, pl. 37,
figs. 1, 2. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: New Jersey.
- **subspatulata** (L. & S.) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 32, 33, pl. 3, fig.
14. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Shrewsbury, N. J.
- **subtrigonalis n. s.** E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
40. St. Louis, 1856-1860. Evans & Shumard
Formation: Cretaceous.
Location: Vicinity of Owl butte, between Moreau
and Grand rivers.

Ostrea—Continued.

- **subtrigonalis** (E. & S.?) Meek.
(1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 510, pl. 40,
figs. 1a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **subtrigonalis** (E. & S.) White.
(1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 308, pl. 61,
figs. 4-7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- **subtrigonalis** (E. & S.) White.
(1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 15, pl. 12,
figs. 2-5. Wash., 1883. C. A. White.
Formation: Cretaceous.
- **subtrigonalis** (E. & S.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 1, p. 83. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous or Laramie.
Location: Middle Fork of the Old Man river,
about two miles above the mouth of the North
fork, Canada.
- **subtrigonalis** (E. & S.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 1, p. 56. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: Woodworth Mine, Medicine Hat, Can-
ada.
- **subtrigonalis** (E. & S.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 1, p. 30. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: Banks of the Belly river at the mouth
of the St. Mary river; Milk River ridge, Can-
ada.
- **subtrigonalis** (E. & S.) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 1, pp. 5, 6. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: Rye Grass flat, Old Man river; Upper
Belly river, twenty-two miles above the mouth
of the Waterton, Canada.
- **tecticosta n. s.** Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser.,
1858-1860, p. 403, pl. 68, figs. 47, 48. Phila.,
1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Tennessee and New Jersey.

Ostrea—Continued.

- **tecticosta** (Gabb) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 50, pl. 17, figs. 10, 11. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Jersey and Tennessee.
- **tecticostata** (Gabb) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 301, pl. 50, figs. 4, 5. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Tennessee and New Jersey.
- **tecticosta** (Gabb) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 33, 34, pl. 3, figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Vicinity of Trenton, N. J.?
- **texana** [Roem.sp.] Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 42, pl. 9, figs. 4-8. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Braunfels, Tex., between El Paso and Frontera, Mexico.
- **torosa** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 10, fig. 1. New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **torosa** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 52, pl. 10, fig. 1. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Mullica hill, N. J.
- **torosa** (d'Orb.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 38, 39, pl. 9, figs. 1-3; pl. 14, figs. 1-4; pl. 15, figs. 1, 2. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Braunfels, Tex.; Delaware, New Jersey, Alabama, South Carolina, Tennessee, Arkansas, and Missouri.
- **torosa** (Morton) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 301. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **translucida** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 147. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Long lake on the Missouri, Nebr.
- **translucida** (M. & H.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 301. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **tuomeyi** n. s. Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, p. 68. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Alabama.
- **tuomeyi** (Coquand) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., pp. 301, 302. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Alabama.

Ostrea—Continued.

- **uniformis** (Meek) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 302, pl. 48, figs. 6-7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: New Mexico.
- **ungulata** (Schlot.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 58, 60, pl. 31, figs. 4-15. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: Delaware, Alabama, New Jersey, Missouri.
- **urticosa** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293. New Haven. S. G. Morton.
Formation: [Cretaceous].
Location: New Jersey.
- **urticosa** Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, pl. 10, fig. 2. New Haven, 1833. S. G. Morton.
- **vellicata** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 156, pl. 11, figs. 2a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: Rio Grande, between El Paso and Frontera.
- **vellicata** (Con.) White. (1884.)
Fourth Ann. Rep. U. S. Geol. Sur., p. 302. Wash., 1884. C. A. White.
Formation: Cretaceous.
- **vesicularis** (Lam.) Owen. (1860.)
Second Rep. Geol. Rec., Ark., pl. 8, fig. 6. Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.
- **vesicularis** (Lam.) Coquand. (1869.)
Monog. Genre Ostrea Terrain Crétacé, pp. 35, 36, pl. 13, figs. 2-10. Marseilles, 1869. H. Coquand.
Formation: Cretaceous.
Location: New Braunfels, Tex., and New Jersey.
- **vesicularis** (Lam.) Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges., Band 22, pp. 225, 226. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.
- **vesicularis** var. **aucella** n. var. Roemer. (1852.)
Kreide von Tex., pp. 74, 75, Taf. 9, figs. 4a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of the Guadalupe, New Braunfels, Tex.
- **vesicularis** var. **Troost**. (1840.)
Fifth Geol. Rep. Tenn., p. 45. Nash., 1840. G. Troost.
Formation: Cretaceous.
Location: Near Purdy, McNairy county, Tenn.
- **vesicularis** var. **Troost**. (1840.)
Fifth Geol. Rep. Tenn., p. 45. Nash., 1840. G. Troost.
Formation: Cretaceous.
Location: Near Purdy, McNairy county, Tenn.

Ostrea—Continued.

- **villicata** (Con.) Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, p. 65, pl. 36, figs. 20, 21. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Rio Grande, between El Paso and Frontera, Tex.
- **vomer** (d'Orb.) Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, p. 39, pl. 16, figs. 13-15. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous[?].
 Location: New Jersey.
- **vomer** (Mort.) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 302, pl. 48, figs. 8-10. Wash., 1884. C. A. White.
 Formation: Cretaceous.
- **washingtoni** n. s. Coquand. (1869.)
 Monog. Genre Ostrea Terrain Crétacé, pp. 63, 64, pl. 33, figs. 5-9. Marseilles, 1869. H. Coquand.
 Formation: Cretaceous.
 Location: Texas flat, Folsom, Cottonwood creek, Shasta county, Cal.
- **wyomingensis** n. s. Meek. (1872.)
 Fifth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 375. Wash., 1872. F. B. Meek.
 Formation: Cretaceous.
 Location: Point of Rocks, Wyo.
- **wyomingensis** Meek. (1873.)
 Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 508, 509. Wash., 1873. F. B. Meek.
 Formation: Cretaceous.
 Location: Point of Rocks, Wyo.
- (**Alectryonia**) **blackii** n. s. White. (1879.)
 Proc. U. S. Nat. Mus., vol. 2, pt. 2, p. 293, pl. 4, figs. 1, 2. Wash., 1880. Smithsonian. Misc. Coll., vol. 19. Wash., 1880. C. A. White.
 Formation: Cretaceous.
 Location: Collin county, Tex.
- (**Alectryonia**) **blackii** White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 11, 12, pl. 14, figs. 1a, b, pl. 17, fig. 4a. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Collin county, Tex.
- (**Alectryonia**) **dilleri** n. s. White. (1889.)
 Bull. U. S. Geol. Sur., No. 51, pp. 14, 15, pl. 1, figs. 1, 2; pl. 2, figs. 1, 2. Wash., 1889. C. A. White.
 Formation: Cretaceous.
 Location: Half a mile south of the falls of Clover creek, Shasta county, Cal.
- (**Alectryonia**) **larva** (Lam.) White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 296, pl. 42, figs. 2-9. Wash., 1884. C. A. White.
 Formation: Cretaceous.

Ostrea—Continued.

- (**Alectryonia**) **procumbens** White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 290, pl. 35, figs. 6-8. Wash., 1884. C. A. White.
 Formation: Jurassic.
 Location: Northwestern Colorado.
- (**Alectryonia**) **sannionis** n. s. White. (1876.)
 Rep. Geol. Uinta Mts., p. 112. Wash., 1876. C. A. White.
 Formation: Cretaceous.
 Location: Weber valley, near Coalville, Utah.
- (**Alectryonia**) **sannionis** White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Coalville, Utah.
- (**Alectryonia**) **sannionis** White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 277, 278, pl. 2, figs. 2a-e. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Valley of Weber river, near Coalville, Utah.
- (**Alectryonia**) **sannionis** White. (1884.)
 Fourth Ann. Rep. U. S. Geol. Sur., p. 300, pl. 45, figs. 3-7. Wash., 1884. C. A. White.
 Formation: Cretaceous.
 Location: Coalville, Utah.
- (**Gryphæa?**) **uniformis** n. s. Meek. (1876.)
 Rep. Expl. Exped. Sante Fe, N. Mex., to junction of Grand and Green rivers, p. 124, pl. 1, figs. 2a-c. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Pagosa, N. Mex.
- (**Gryphæostrea?**) **subalata** n. s. Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 15, 16, pl. 28, figs. 5. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Moreau river.
- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 18, p. 245. New Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: Near Arneytown, N. J.
- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 284. New Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: Mullica hill, N. J.
- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 284. New Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: [New Jersey?]

Ostrea—Continued.

- sp. undet. Roemer. (1849.)
Texas, p. 394. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and Waco camp near New Braunfels, Tex.
- sp. undet. Roemer. (1852.)
Kreide von Tex., p. 76. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- sp. undet. Roemer. (1852.)
Kreide von Tex., p. 76. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waco camp on the Guadalupe above New Braunfels, Tex.
- sp. undet. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 275. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- sp. undet. Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 430. Phila., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Near Coalville [Utah].
- sp. undet. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 12, 13, pl. 2, figs. 8a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Saline county, Kans.
- sp. undet. Whiteaves. (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, p. 83. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- sp. undet. Meek. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1, pp. 140, 141, pl. 15, figs. 10a-c. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: Coalville, Utah.
- sp. undet. Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 175. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Entrance to Departure bay, Vancouver island.
- — sp. ? H. & W. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 2, pp. 285, 286, pl. 7, fig. 12. Wash., 1877. Hall & Whitfield.
Formation: Jurassic.
Location: Northwest of Rawlings station, Wyo.
- — ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.

Ostrea—Continued.

- — ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.
- — ? White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 39. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Waldron island.
- Ovulina clava** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 2b. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- Oxystele** (Phillippi) White. (1885.)
Bull. U. S. Geol. Sur., No. 22, p. 12. Wash., 1885. C. A. White.
- Oxytoma mucronata** (Meek) Whiteaves. (1884.)
Geol. and Nat. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 238, 239, pl. 31, fig. 9. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East side of Alliford bay; south side of Maud island.
- **mucronata** (M. & H.) Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 251, pl. 33, figs. 6, 6a, b. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Maud island.
- **n. subgen. Meek.** (1864.)
Check List Invert. Foss. N. Am. Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 39. Wash., 1864. F. B. Meek.
- Pachycardium n. g.** Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 96. Phila., 1870. T. A. Conrad.
- (subgen. Conrad) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 172. Wash. 1876. F. B. Meek.
- **burlingtonense n. s.** Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 138, pl. 21, figs. 6, 7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near Burlington, ? N. J.
- **spillmani n. s.** Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 96. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Mississippi.
- Pachymya** [Sow.] Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 604. St. Louis, 1856-1860. B. F. Shumard.

Pachymya—Continued.— **austinensis** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 604, 605. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Shoal creek, near Austin, Tex.

— **austinensis** (Shum.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 298, pl. 8, figs. 1a, b; pl. 5, figs. 7a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Shoal creek, near Austin [Tex.]. Salado, Bell county, Tex.

— **? compacta** n. s. White. (1879.)

Proc. U. S. Nat. Mus., vol. 2, pt. 2, p. 297, pl. 6, figs. 3, 4. Wash., 1880. Smithsonian. Misc. Coll., vol. 19. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Bell county, Tex.

— **compacta** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 22, 23, pl. 17, figs. 4a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Bell county, Tex.

— **? herseyi** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Mouth of Saint Vrain creek, and in the valley of the Cache à la Poudre; also in the valley of Bear creek, near Morrison, Colo.

— **? herseyi** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.

— **? herseyi** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 298, 299, pl. 5, figs. 5a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near the confluence of the Saint Vrain with the South Platte, northern Colorado.

— **? truncata** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 301, 302. Wash., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Vicinity of Salt Lake.

Pachyodon (subgen. Gabb) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 241. Wash., 1876. F. B. Meek.

Pachythærus n. g. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, p. 47. Phila., 1870. T. A. Conrad.

— subgen. Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 50. Phila., 1872. T. A. Conrad.

Palæstacus (?) **ornatus** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 183, 184, pl. 25, fig. 3. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sounding creek, Township 30, Range 8, west of the fourth principal meridian, Northwest Territory.

Palæatractus n. g. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, pp. 148, 149. Phila., 1869. W. M. Gabb.

— **crassus** n. s. Gabb. (1869.)

Geol. Sur. Cal., Paleont., vol. 2, p. 148, pl. 26, fig. 26. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Canyon in the foothills, a mile south of the road from Colusa to the Sulphur springs, near the eastern margin of the Coast Range, Colusa county, Cal.

Palæmcæra (subgen. *Stoliczka*) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

Paliurus n. g. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 324. Phila., 1876. W. M. Gabb.

— **pentangulatus** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 302, 303, pl. 4, figs. 4a, b. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Monument creek, near Colorado springs [Colo.].

— **triangularis** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 324. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Vincentown, N. J.

Palmula n. g. Lea. (1833.)

Cont. Geol., p. 219. Phila., 1833. Isaac Lea.

— **sagittaria** n. s. Lea. (1833.)

Cont. Geol., pp. 219, 220, pl. 6, fig. 228. Phila., 1833. Isaac Lea.
Formation: Cretaceous.
Location: Timber creek, N. J.

Paludina conradi n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 122. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Bad lands of the Judith.

— **leidyi** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 123. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Ten miles below Fort Union.

— **leai** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 121, 122. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Union.

Paludina—Continued.

- **multilineata** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 120, 121. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Clark.

- **peculiaris** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 122. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Fort Clark.

- **retusa** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 122. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union.

- **trochiformis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 122, 123. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Ten miles below Fort Union.

- **vetula** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 121. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Bad lands of the Judith.

- Panopæa [Ménard] Conrad.** (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275. Phila., 1850-1854. T. A. Conrad.

- **ædilis** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, pp. 162, 163, Taf. 12, figs. 14, 15. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **alata** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, p. 162, Taf. 13, figs. 3, 4. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **aleutica** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, p. 159, Taf. 12, figs. 7, 8. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **concentrica** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 148, pl. 22, fig. 119. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood creek and Martinez, Cal.

- **curta** n. s. Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 12, 13, pl. 2, fig. 3. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Forks of Devil's Pine and Three hills creeks, Canada.

Panopæa—Continued.

- **decisa** n. s. Conrad. (1853.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 19. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Burlington county, N. J.; Chesapeake and Delaware canal.

- Panopæadecisa (Con.) Whitfield.** (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 181, 182, pl. 24, figs. 5-8. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holland, Monmouth county and near Burlington and elsewhere in New Jersey.

- Panopæa dilatata** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, pp. 159, 160, Taf. 12, figs. 9, 11. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- Panopea elliptica** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 219, 220, pl. 28, figs. 24, 25. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near New Egypt, N. J.

- Panopæa inflata** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, p. 158, Taf. 12, figs. 5-6. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **occidentalis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, pp. 270, 271. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Near mouth of Judith river, Nebr.

- **newberryi** n. s. Shumard. (1859.)
Trans. Acad. Sci. St. Louis, vol. 1, 1856-1860, p. 605. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Parker county and Comanche peak, Johnson county, Tex.

- **protracta** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, pp. 160, 161, Taf. 13, figs. 8-9. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **retracta** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, pp. 161, 162, Taf. 13, figs. 5-7. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

- **rustica** n. s. Eichwald. (1871.)
Geog. Paleont. Bermerk. Halb. Mang. aleutischen Inseln, p. 164, Taf. 12, figs. 12, 13. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

Panopæa—Continued.— **simulatrix** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 11, 12, pl. 2, fig. 2, 2a Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South bank of Knee hills creek, in township 29, range 22, west of the fourth meridian; Rye Grass flat on the Old Man river; mouth of East Arrowwood creek, on the Bow river; Belly river, twenty-three miles above the mouth of the Waterton, Canada.

— **subovalis** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 44, 45, pl. 6, figs. 6, 6a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Four miles south of Battle river, township 38, between ranges 12 and 13, west of fourth meridian, Canada.

— **subparallela** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 605, 606. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Fannin county, Tex.

— **subplicata** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862, pp. 199, 200. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Chatfield Point, Navarro county, Tex.

— **texana** Shumard. (1853.)

Expl. Red River, La., by R. B. Marcy, p. 207, pl. 6, fig. 1. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Camp No. 4, Cross Timbers, Tex.

— (**Myacites**) **subelliptica** n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, pp. 52, 53. Phila., 1859. Meek & Hayden.

Formation: Jurassic.

Location: Western and southwestern base Black hills.

— ? **sp. undet.** Roemer. (1849.)

Texas, p. 407. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Upper course of Pedernales river, Tex.

— **sp. undet.** Roemer. (1852.)

Kreide von Tex., p. 45. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: On the upper course of Pedernales river, Tex.

Paramelania (Smith) White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 98. Wash., 1883. C. A. White.

Paramithrax (Milne-Edwards) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 37. Wash., 1883. C. A. White.

Paramithrax—Continued.— ? **walkeri** (Whitfield) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 37, 38, pl. 16, fig. 1a; pl. 17, fig. 1a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near San Antonio, Tex.

— **n. g.** Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 8. Phila., 1867. T. A. Conrad.

Paranomias n. subgen. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290. Phila., 1858-1860. T. A. Conrad.

— **lineata** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 45. pl. 9, fig. 10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Upper Freehold, N. J.

— **saffordi** (Conrad sp.) Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 8. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

— **saffordi** (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 320. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— **scabra** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 44, pl. 10, fig. 10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey.

Parapholas (Conrad) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 300. Wash., 1879. C. A. White.

— **sphenoideus** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 300-302, pl. 5, figs. 1a-d. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, southern Utah.

Parasmilia austinensis n. s. Roemer. (1888.)

Paleont., Abhandl. Vierter Band., Heft. 4, p. 6, Taf. 1 [xxx], figs. 1a, 1b. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

— **balanophylloides** n. s. Bölsche. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 215, 216. Berlin, 1870. Wilh. Bölsche.

Formation: Cretaceous.

Location: Woodbury, N. J.

Patella (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 50. Phila., 1834. S. G. Morton.

— tentorium n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 291. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

— tentorium Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 50, pl. 1, fig. 11. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Near Arneytown, N. J.

— traskii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 140, pl. 21, fig. 103. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 244. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Patoceras n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 485. Wash., 1876. F. B. Meek.

Patula subgen. (Haldeman) White. (1880.)

Proc. U. S. Nat. Mus., vol. 3, p. 160. Wash., 1880. Smithsonian. Misc. Coll., vol. 22. Wash., 1880. C. A. White.

— angulifera n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 18, pl. 2, figs. 6, 6a, b. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Pincher creek, Canada.

— obtusata n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 18, 19, pl. 2, figs. 7, 7a, b. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Old Man river, twelve miles below Fort McLeod, and two miles above Rye Grass flat; Belly river, seven miles above the mouth of the Old Man river, Canada.

Papyridea (Swains.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326. Phila., 1855-1858. T. A. Conrad.

— bella n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 326. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Pecten (Linn.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 285. New Haven, 1830. S. G. Morton.

— acutiplicatus n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 46, pl. 8, fig. 3. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

Pecten—Continued.**— æquicostatus (Lam.) Roemer. (1849.)**

Texas, pp. 398, 399. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Upper Brazos river and crossing of the Cibolo between New Braunfels and San Antonio, Tex.

— anatipes n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 5, fig. 4. New Haven, 1833. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Claiborne, Ala.

— anatipes Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 58, pl. 5, fig. 4. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Claiborne, Ala.

— argillensis n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-1860, p. 283. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Ala. [Miss.].

— asper (Lam.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 328.

Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Tennessee. ?

— bellistriata n. s. Meek. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 311.

Phila., 1861. F. B. Meek.

Formation: Jurassic.

Location: Red buttes on the North Platte (lat. 42° 50', long. 106° 40' W.).

— burlingtonensis n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 304, pl. 48, fig. 26. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

— californicus n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 201, 202, pl. 31, fig. 270. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

— calvatus n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 58, 59, pl. 10, fig. 3. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Near the Eutaw springs, S. C.

— calvatus n. s. Morton.

Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 10, fig. 3. New Haven, 1833. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: South Carolina.

— carlottensis n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can.; Mes. Foss., vol. 1, pt. 3, p. 251, pl. 33, fig. 7. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

Pecten—Continued.

- **complexicosta** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 199, pl. 33, figs. 97, 97a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Morgan valley, south of Clear lake, Cal.
- **craticula** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293. New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **craticula** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 57, 58. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Near Arneytown, New Jersey.
- **deformis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 33, 34, pl. 6, fig. 34. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Gifford's ranch, Plumas county, Cal.
- **duplicosta** n. s. Roemer. (1849.)
Texas, p. 398. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Upper course of Pedernales river, Tex.
- **duplicosta**. Roemer. (1852.)
Kreide von Tex., pp. 65, 66, Taf. 8, figs. 2a-b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: On the upper course of Pedernales river, Tex.
- **extenuatus** n. s. (M. & H.) (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 184. Phila., 1861. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills, Nebr.
- **interradiatus** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 199, 200, pl. 33, figs. 98, 98a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: East of New Idria, Cal.
- **martinezensis** n. s. Gabb. (1869.)
Geol. Sur. Cal., Paleont., vol. 2, pp. 198, 199, pl. 33, fig. 96. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- **membranosus** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 10, fig. 4. New Haven, 1833. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: South Carolina.
- **membranosus** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 59, pl. 10, fig. 4. Phila., 1834. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: South Carolina.
- **mississippiensis** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 283. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.

Pecten—Continued.

- **nebrascensis** n. s. (M. & H.) (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 87. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, one hundred and fifty miles from its mouth, Nebr.
- **newberryi** n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur., Rocky Mt. Region; Prelim. Rept. Paleont. Black hills, pp. 16, 17. Wash., 1877. R. P. Whitfield.
Formation: Jurassic.
Location: T— Spring, west of the Black hills of Dakota.
- **newberryi** Whitfield. (1880.)
Rep. Geol. Black Hills of Dakota, pp. 350, 351, pl. 4, figs. 12-15. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: T— Springs, west of the Black hills of Dakota.
- **nilssoni** (Goldfuss) Roemer. (1852.)
Kreide von Tex., p. 67, Taf. 8, fig. 6. Bonn., 1852. F. Roemer.
Formation: Cretaceous.
Location: Ravine three miles from New Braunfels, on road to Seguin, Tex.
- **nilssonii** (Roem.) Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 365. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
- **operculiformis** n. s. Gabb. (1864.)
Geol. Sur. Cal., Paleont., vol. 1, p. 201, pl. 26, fig. 188. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Cottonwood and Huling creeks, Shasta county; Curry's, south of Mount Diablo, Cal.
- **?perisphinctes payeri** n. s. Toulou. (1874.)
Die Zweite Deutsche Nordpolarfahrt Zweiter Band, pp. 498, 499, Taf. 1, figs. 1a-c. Leipzig, 1874. Franz Toulou.
Formation: Jurassic [Cretaceous?].
Location: Kuhn island, east coast of Greenland.
- **perplanus** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 5, fig. 5. New Haven, 1833. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: Claiborne, Ala.
- **perplanus** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 58, pl. 5, fig. 5; pl. 15, fig. 8. Phila., 1834. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: Claiborne, Ala.
- **planicostatus** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 48, 49, pl. 8, figs. 10, 11. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: G. C. Schanck's pits, near Marlboro, N. J.
- **poulsoni** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 59, pl. 19, fig. 2. Phila., 1834. S. G. Morton.
Formation: Cretaceous [Tertiary].
Location: Near Claiborne, Ala.

Pecten—Continued.**— quadricostatus (Sow.) Roemer. (1849.)**

Texas, p. 398. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford near New Braunfels, Fredericksburg, and Waco camp, Tex.

— quadricostatus (Sow.) Roemer. (1852.)

Kreide von Tex., p. 64. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, New Braunfels, Tex.

— quadricostatus (Sow.) Shumard. (1853.)

Expl. Red river, La., by R. B. Marcy, p. 204, pl. 3; fig. 6; pl. 2, figs. 2a, b. Wash., 1853. B. F. Shumard.

Formation: Cretaceous.

Location: Fort Washita, Ind. Ter.

— quadricostatus (Sow.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, p. 232. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Middletown, N. J.

— quadricostatus var. Roemer. (1852.)

Kreide von Tex., p. 64, Taf. 8, figs. 4a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— quinquecostatus (Sow.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 5. New Haven, 1830. S. G. Morton.

— quinquecostatus (Sow.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 285. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: United States.

— quinquecostatus (Sow.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 57, pl. 19, fig. 1. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

— quinquecostatus (Sow.) Bronn. (1838.)

Lethaea Geognostica, Zweiter Band, pp. 678-680, Taf. 30, fig. 17. Stuttgart, 1838. H. G. Bronn.

Formation: Cretaceous.

Location: New Jersey.

— quinquenaria n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 10. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal.

Pecten—Continued.**— quinquenarius (Con.) Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, p. 47, pl. 7, figs. 13-16. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: G. C. Schanck's pits, Marlboro, N. J.

— rhodani (Pict. & Camp.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 135-137. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula.

— rigida n. s. H. & M. (1854.)

Mem. Am. Acad. Arts and Sci.; n. ser., vol. 5, p. 381, pl. 2, figs. 4a-c. Cambridge and Boston, 1855. Hall & Meek.

Formation: Cretaceous.

Location: Sage creek, Nebr.

— simplicius n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 283, 284, pl. 46, fig. 44. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— tenuitesta n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 327, 328. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington and adjoining counties, N. J.

— tenuitestus (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 47, 48, pl. 7, figs. 5, 6. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, G. C. Schanck's pits, near Marlboro and Burlington, N. J.

— texanus n. s. Roemer. (1852.)

Kreide von Tex., p. 65, Taf. 8, figs. 3a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: River drift at crossing of Cibola between New Braunfels and San Antonio, Tex.

— texanus n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 365. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey and Alabama.

— traskii n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 200, 201, pl. 26, figs. 186, 187, a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— traskii Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 198, pl. 32, fig. 95. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal., north shore of Departure bay, near Nanaimo, Vancouver island.

Pecten—Continued.

- **venustus** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 5, fig. 7. New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **venustus** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 58, pl. 5, fig. 7. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Near Arneytown, N. J.
- **venustus** (Mort.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 45, 46, pl. 8, figs. 1-4. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Monmouth, Freehold, Burlington, Arneytown, etc., N. J.
- **virgatus** (Nilsson) Roemer. (1849.)
Texas, p. 399. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall, near New Braunfels, and Fredericksburg, Tex.
- **virgatus** (Nilsson) Roemer. (1852.)
Kreide von Tex., pp. 66, 67, Taf. 8, figs. 5a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ravine, three miles from New Braunfels, on road to Seguin, Waterfall of the Guadalupe and Fredericksburg, Tex.
- (**Chlamys**) **craticulus** (Mort.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 49, 50, pl. 7, figs. 17, 18. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Arneytown and Vincentown [?], N. J.
- (**Syncyclonema**?) **perlamellosus** (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 50, 51, pl. 7, fig. 7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- **sp. undet.** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, p. 245. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
- **sp. undet.** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 18, p. 245. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
- **sp. undet.** Roemer. (1849.)
Texas, p. 399. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Ravine, on the Guadalupe, three miles below New Braunfels, Tex.
- **sp. undet.** Roemer. (1849.)
Texas, p. 399. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waco camp, near New Braunfels, Tex.

Pecten—Continued.

- [sp. undet.] Gabb. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 16. Phila., 1870. W. M. Gabb.
Formation: Jurassic.
Location: Volcano, about thirty miles southeast of Walker's lake, Nev.
- **sp. undet.** Urquiza. (1882.)
An. Min. Fomento Rep. Mex., Tomo 7, p. 225, figs. 17, 18. Mexico, 1882. M. Urquiza.
Formation: Cretaceous.
Location: Canada de la Guayabilla, Coalcoman district, state of Michoacan, Mexico.
- Pectunculina parvula** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 85. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, Nebr.
- Pectunculus** [Lam.] Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 64. Phila., 1834. S. G. Morton.
- (subgen. **Adan.**) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 166. Wash., 1876. F. B. Meek.
- **australis** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 64. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **globulus** n. s. Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 124, 125, Taf. 15, figs. 9, 10. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Kadiak island, Alaska.
- **hamula** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 64, pl. 15, fig. 7. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Prairie bluff, Ala.
- **siouxensis** n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s. p. 384, pl. 1, fig. 12. Cambridge and Boston, 1855. Hall & Meek.
Formation: Cretaceous.
Location: Mouth of Big Sioux, on the Missouri river.
- **subimbricatus** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 146. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Heart river, Nebr.
- (**Cardium**) **aleuticus** (Gir.) Eichwald. (1871.)
Geog. Peleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 125, 126. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaskan peninsula and Kadiak, Unga, and Atcha islands.

Pectunculus—Continued.

- *sp. undet.* Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
- *sp. undet.* Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 64. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.

Pentacrinites (Mille.) Meek. (1860.)

- Rep. Expl. Great Basin Terr. Utah, p. 355. Wash., 1876. F. B. Meek.
- *asteriscus* M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 67, pl. 3, figs. 2, *a*, *b*, and wood cut. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills, and opposite Red buttes, North Platte river.
- *asteriscus?* (M. & H.) H. & W. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 2, pp. 280, 281, pl. 6, fig. 16. Wash., 1877. Hall & Whitfield.
Formation: Triassic.
Location: Near Dun Glen pass, Pah-Ute range, Nev.

— *asteriscus* (M. & H.) Whitfield. (1880.)

- Rep. Geol. Black Hills of Dakota, p. 345, pl. 3, figs. 1, 2. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Big Horn mountains.
- (*sp. undet.*) Meek. (1860.)
Rep. Expl. Great Basin Terr. Utah, p. 355. Wash., 1876. F. B. Meek.
Formation: Jurassic.
Location: Near Red buttes, on the North Platte.

Pentacrinus asteriscus n. s. M. & H. (1858.)

- Proc. Acad. Nat. Sci., Phila., for 1858, pp. 49, 50. Phila., 1859. Meek & Hayden.
Formation: Jurassic.
Location: South and southwest base of Black hills; Stone butte.
- *asteriscus* (M. & H.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur., west of one-hundredth meridian, vol. 4, pt. 1, pp. 162, 163, pl. 13, figs. 6*a*, *b*. Wash., 1875. C. A. White.
Formation: Jurassic.
Location: Salt creek near Nephi, and Diamond valley near St. George, Utah; also in Utah.
- *bryani* n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 178, pl. 5, figs. 1, 1*a*, *b*. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Neighborhood of Vincentown, N. J.

Periaster (d'Orb.) Desor. (1858.)

- Synop. Echinoides Foss., p. 382. Paris and Wiesbade, 1858. E. Desor.

Periaster—Continued.

- *texanus* (Roemer sp.) Desor. (1858.)
Synop. Echinoides Foss., pp. 384, 385. Paris and Wiesbade, 1858. E. Desor.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New Braunfels, Tex.

Periploma (Schum.) Con. (1858.)

- Jour. Acad. Nat. Sci., Phila., vol. 3, 2d. ser., 1855-1858, p. 324. Phila., 1855-1858. T. A. Conrad.

— *applicata* n. s. Conrad. (1858.)

- Jour. Acad. Nat. Sci., Phila., vol. 3, 2d. ser., 1855-1858, p. 324. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.

— *applicata* Conrad. (1860.)

- Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 276, pl. 46, fig. 3. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.

— *cuspidatum* n. s. Whiteaves. (1884.)

- Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 220, 221, pl. 29, figs. 4, 4*a*, *b*. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: North side of Maud island.

— *suborbiculatum* n. s. Whiteaves. (1879.)

- Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 138, 139, pl. 17, fig. 6. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two miles and a quarter up.

— *sp. undet.* Conrad. (1870.)

- Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 76, pl. 3, fig. 10. Phila., 1871. T. A. Conrad.

Periplomya (Con.) Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, p. 305. Phila., 1876. W. M. Gabb.

— *elliptica* (Gabb.) Whitfield. (1885.)

- Mon. U. S. Geol. Sur., vol. 9, pp. 177, 178, pl. 23, figs. 14-15. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Mullica hill and Holmdel, N. J.

— *elliptica* Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, p. 305. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.

— *truncata* n. s. Whitfield. (1885.)

- Mon. U. S. Geol. Sur., vol. 9, pp. 220, 221, pl. 28, figs. 20, 21. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Near New Egypt, N. J.

Perisphinctes anceps? (Reinecke sp.) Whiteaves. (1878.)

- Canadian Naturalist, vol. 8, n. ser., No. 7, p. 407. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

Perisphinctes—Continued.— **anceps** ? (Reinecke sp.) Whiteaves. (1878.)

Geol. Sur., Can.; Rep. Prog., for 1876, 1877, p. 157.
Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

— **operculiformis** (Gabb) Eichwald. (1871.)

Geol. Paleont., Bemerk. Halb. Mang. aleutischen Inseln, p. 199, Taf. 19, figs. 5, 6. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: North shore of Katschemak bay, Alaska.

— **skidegatensis** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur., Can.; Mes. Foss., vol. 1, pt. 3, p. 210. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud island.

Perna (Brug.) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 37. Wash., 1889.
C. A. White.

— **excavata** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 37, pl. 7, fig. 1.
Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Sucia island, Sheep Jack island and Waldron island.

Pernites sp. undet. Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo. 3, p. 657,
Lam. 1, fig. 5. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojado, Mexico.

Peronæa (subgen. Poli) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr. vol. 9, p. 194. Wash.,
1876. F. B. Meek.

Peronæoderma (Poli) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 308.
Phila., 1876. W. M. Gabb.

— (subgen. Poli) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash.,
1876. F. B. Meek.

— **georgiana** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 308.
Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Perrisonota n. g. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 98.
Phila., 1870. T. A. Conrad.

— **protecta** n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 98,
pl. 9, fig. 24. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **protecta** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 110, pl. 11, figs.
14, 15. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

Perissolax n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 91. Phila.,
1864. W. M. Gabb.

— **blakei** (Con.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 92. pl. 21, fig.
110. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez; near the coal mines at Clayton, Cochran's east of Mount Diablo, and near the Cañada de las Uvas, Los Angeles county, Cal.

— **blakei** (Con. sp.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 149, 150.
Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **brevirostris** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 91, pl. 19, fig. 43.
Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Martinez, Pence's ranch etc., Cal.

— **brevirostris** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 121.
Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— **brevirostris** (Gabb) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 46. Wash.,
1889. C. A. White.

Formation: Cretaceous.

Location: Sheep Jack islands.

Petricola (Lam.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 216. Wash.,
1885. R. P. Whitfield.

— **nova-ægyptica** n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 216, 217, pl.
28, fig. 22. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near New Egypt, N. J.

Phanerostomum asperum Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 24. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **asperum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 42. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **dilatatum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 16, 30. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **globulosum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 44. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Phanerostomum—Continued.— **hexacyclus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 31. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **hexaleptum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 22. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **hispidulum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 22, 29. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **lacerum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 17, 18. Leipzig,

1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **laeve** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 19. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **porulosum** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 15. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **senarium** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 25. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **quarternarium** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 20. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **quarternarium** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 46. Leipzig, 1854.

C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Pharella (Gray) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 147. Phila.,

1864. W. M. Gabb.

— **alta** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 147, pl. 22, fig.

118. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Hills west of Martinez, Cal.

— ? **dakotaensis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 251, 252, pl.

1, fig. 3. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Vermilion river, Nebr.

Pharella—Continued.— ? **pealei** n. s. Meek. (1873.)Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
p. 496. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Missouri river, below Gallatin, Mont.

— ? **pealei** (Meek) White. (1883.)Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 21, 22, pl. 11, figs. 6a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Missouri river, below Gallatin, Mont.

Phasianella [Lam.] Shumard. (1859.)Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
597. St. Louis, 1856-1860. B. F. Shumard.— **ervina** (d'Orb.) Eichwald. (1871.)Geog. Paleont. Bemerk. Halb. Mang. aleutischen
Inseln, p. 118. St. Petersburg, 1871. E. Eich-
wald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— **perovata** n. s. Shumard. (1859.)Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p.
597. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Comanche peak, and in Parker county,
near Brazos river, Tex.— **punctata** n. s. Gabb. (1860.)Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 299, pl. 48, fig. 3. Phila., 1858-1860.
W. M. Gabb.

Formation: Cretaceous.

Location: Mullica hill, N. J.

— **sp. undet.** Roemer. (1849.)

Texas, p. 414. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

— ? **sp. undet.** Roemer. (1852.)

Kreide von Tex., p. 38. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

Pholadomya [Sow.] Morton. (1834.)Synop. Org. Rem. Cret. Gr. U. S., p. 68. Phila.,
1834. S. G. Morton.

— (Sow. typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 214. Wash.,
1876. F. B. Meek.— **anteradiata** n. s. Conrad. (1860.)Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 276, pl. 46, fig. 3. Phila., 1858-1860. T.
A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— **borealis** n. s. Meek. (1858.)Trans. Albany Inst., vol. 4, pp. 40, 41. Albany,
1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

Pholadomya—Continued.

- **brewerii** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 152, pl. 22, fig. 123. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Pence's ranch, Butte county, Cal.
- **humilis** n. s. M. & H. (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, p. 182. Phila., 1861. Meek & Hayden.
 Formation: Jurassic.
 Location: Southwest base of the Black hills, Nebr.
- **humilis** M. & H. (1865.)
 Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14. No. 172, p. 104, pl. 4, figs. 3, a, b. Wash., 1865. Meek & Hayden.
 Formation: Jurassic.
 Location: Southwest base of the Black hills.
- **kingii** (Meek) White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 150, 151, pl. 38, figs. 3a, b. Wash., 1883. C. A. White.
 Formation: Jurassic.
 Location: Near the lower canyon of the Yellowstone river, Mont.
- **lincecumi** n. s. Shumard. (1861.)
 Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 199. Boston, 1862. B. F. Shumard.
 Formation: Cretaceous.
 Location: Corsicana, Navarro county, Tex.
- **littlei** n. s. Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, pp. 305, 306. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Pataula creek, Clay county, Ga.
- **multilineata** n. s. Gabb. (1869.)
 Am. Jour. Conch. vol. 5, Phila., 1869, 1870, p. 10, pl. 5, fig. 6. Phila., 1870. W. M. Gabb.
 Formation: Jurassic.
 Location: Volcano, about thirty miles southeast of Walker's lake, Nev.
- **nasuta** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 152, pl. 30, fig. 124. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Shore of the Straits of Carquines, two miles west of Martinez, Cal.
- **nevadana** n. s. Gabb. (1869.)
 Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 10, pl. 5, fig. 7 [9]. Phila., 1870. W. M. Gabb.
 Formation: Jurassic.
 Location: Volcano, about thirty miles southeast of Walker's lake, Nev.
- **occidentalis** n. s. Morton. (1833.)
 Am. Jour. Sci., 1st ser., vol. 23, p. 292, pl. 8, fig. 3. New Haven, 1833. S. G. Morton.
 Formation: Cretaceous.
- **occidentalis** Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 68, pl. 8, fig. 3. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Chesapeake and Delaware canal.

Pholadomya—Continued.

- **occidentalis** (Mort.) Conrad. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 276, 277. Phila., 1858-1860. T. A. Conrad.
 Formation: Cretaceous.
 Location: Tippah county, Miss.
- **occidentalis** (Mort.) Owen. (1860.)
 Second Rep. Geol. Rec. Ark. pl. 8, fig. 9. Phila., 1860. D. D. Owen.
 Formation: Cretaceous.
 Location: Arkansas.
- **occidentalis** (Mort.) Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, pp. 175, 176, pl. 24, figs. 1-3. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: Monmouth, Burlington, and other localities in the lower green marls of New Jersey.
- **orbiculata** n. s. Gabb. (1864.)
 Proc. Cal. Acad. Nat. Sci., vol. 3, p. 173. San Francisco, 1863-1868. W. M. Gabb.
 Formation: Jurassic [Cretaceous?].
 Location: Mariposa estate, Mariposa county, Cal.
- **[?] orbiculata** (Gabb) Meek (1865.)
 Geol. Sur. Cal. Geol., vol. 1, p. 481, pl. 1, fig. 4. Phila., 1865. F. B. Meek.
 Formation: Jurassic [Cretaceous?].
 Location: Mariposa estate, Cal.
- **oregonensis** n. s. Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 178, pl. 29, fig. 65. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Near the toll house at the summit of the Siskiyou mountains, near the southern boundary of Oregon.
- **ovuloides** n. s. Whiteaves. (1876.)
 Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 59, 60, pl. 9, fig. 9. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte islands.
- **panderi** n. s. Eichwald. (1871.)
 Geogr. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, pp. 165, 166, Taf. 13, figs. 10, 11. St. Petersburg, 1871. E. Eichwald.
 Formation: Cretaceous.
 Location: Alaska.
- **papyracea** n. s. M. & H. (1862.)
 Proc. Acad. Nat. Sci., Phila., for 1862, p. 23. Phila., 1863. Meek & Hayden.
 Formation: Cretaceous.
 Location: Chippewa point, near Fort Benton, on the Missouri river.
- **papyracea** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 217, pl. 5, figs. 4a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Chippewa point on the upper Missouri.

Pholadomya—Continued.**— papyracea (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 85. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest branch of North fork of the Old Man river about four miles below the mouth of Oyster creek, Canada.

— papyria n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 276. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— pedernalis n. s. Roemer. (1852.)

Kreide von Tex., pp. 45, 46, Taf. 6, figs. 4, a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— postsulcata n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 276. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— roemerii n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 176, 177, pl. 24, fig. 4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schanck's pits, near Marlboro, Monmouth county, N. J.

— royana (d'Orb.) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 140, 141. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gabriola island; Sucia islands.

— sancti-sabæ (Roemer.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 164, pl. 21, fig. 4. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: New Braunfels, Tex.

— scaphæformis n. s. Eichwald. (1871.)

Geogr. Paleont. Bemerk. Halb. Mang., aleutischen Inseln, pp. 164, 165, Taf. 13, figs. 1, 2. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— sonorensis n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 265, pl. 36, fig. 12. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Mexico.

— subelongata n. s. Meek. (1858.)

Trans. Albany Inst., vol. 4, p. 42. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

Pholadomya—Continued.**— subelongata Meek. (1876.)**

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 362, pl. 2, figs. 1, 1a. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island, also on New Castle island.

— subelongata (Meek). White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 42, 43. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Waldron island.

— subventricosa n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 142. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

— subventricosa (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 217, 218, pl. 39, figs. 8, a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Idaho Ter.

— subventricosa (M. & H.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 178. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: North Saskatchewan river, at Fort Pitt, and in township 54, range 2, west of the fourth principal meridian, Northwest Territory.

— texana n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 152, pl. 19, fig. 3. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Turkey creek, Leon and Eagle pass roads.

— tippana n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, pl. 34, fig. 9, p. 324. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— undata n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 81. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

— vancouverensis n. s. Whiteaves. (1882.)

Proc. and Trans. Roy. Soc., Can., vol. 1, sec. 4, p. 83, fig. 2. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northeast slope of Jackass mountain, in the valley of the Lower Fraser, Canada.

— (Protocardia) hodgii Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 219, pl. 13, figs. 3a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the great bend of the Missouri, below Fort Pierre.

Pholadomya—Continued.

- *sp. undet.* Roemer. (1849.)
Texas, p. 408. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- *sp. undet.* Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 428.
Phila., 1871. F. B. Meek.
Formation: Jurassic.
Location: Salinas creek, Hot springs.
- Fischer. (1872.)
Comptes Rend., 1872, vol. 65, p. 1785. Paris, 1872.
P. Fischer.
Formation: Jurassic? [Cretaceous?].
Location: Alaska.
- *sp. undet.* Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 263,
Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island, two
and one-fourth and two and one-half miles up.
- *sp. undet.* Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 265
Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Gabriola island.
- Fischer. (1875.)
Voyages a la Cote Nord-Quest de l'Amerique, p.
34, pl. A, figs. 3, 3a, par Alph. L. Pinart. Paris,
1875. P. Fischer.
Formation: Jurassic [Cretaceous?].
Location: Alaska.
- ? White. (1878.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.,
Terr., p. 184. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Mouth of Saint Vrain creek, Colo.
- Pholas (Linn.) Morton. (1834.)**
Synop. Org. Rem. Cret. Gr., U. S., p. 68. Phila.,
1834. S. G. Morton.
- *cithara n. s.* Morton. (1834.)
Synop. Org. Rem. Cret. Gr., U. S., p. 98, pl. 9, fig.
10. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Monmouth county, N. J.
- *cithara* (Mort.) Whitfield. (1885.)
Mong. U. S. Geol. Sur., vol. 9, pp. 187, 188, pl. 25,
figs. 14-16. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Mr. G. C. Schanck's marl pits, near
Marlboro, N. J.
- *cretacea n. s.* Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 393, pl. 68, fig. 18. Phila., 1858-1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Rairitan bay, N. J.
- *cretacea* Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 324.
Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, N. J.

Pholas—Continued.

- *cuneata n. s.* M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 53.
Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Long lake.
- (?) *lata n. s.* Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 189, 190, pl. 25,
fig. 17. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Marlboro, N. J.
- *pectorosa n. s.* Conrad. (1852.)
Proc. Acad. Nat. Sci., Phila., vol. 6, 1852, 1853, p.
200. Phila., 1854. T. A. Conrad.
Formation: Cretaceous.
Location: Tinton Falls, Monmouth county, N. J.
- *pectorosa* Conrad. (1854.)
Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser. 1850-
1854, p. 299, pl. 27, fig. 9. Phila., 1850-1854,
T. A. Conrad.
Formation: Cretaceous.
Location: Tinton Falls, Monmouth county, N. J.
- *sp. undet.* Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 292. New Ha-
ven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: Monmouth county, N. J.
- Phylloceras (Suess) Meek. (1876.)**
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 458. Wash.,
1876. F. B. Meek.
- ? *halli* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 458-462,
pl. 24, figs. 3a-c, fig. 64, p. 458. Wash., 1876.
F. B. Meek.
Formation: Cretaceous.
Location: One hundred and fifty miles above the
mouth of Milk river, on the Missouri, in Mont.
- ? *ramosus* Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2,
No. 4, pp. 371-373, pl. 5, figs. 1, 1a, b. Wash.,
1876. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, Vancouver island; also in the
lower division of the California Cretaceous, at
Cottonwood creek, Shasta county, Cal.
- Phylloda (subgen. Schumacher) Meek. (1876.)**
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash.,
1876. F. B. Meek.
- Phylloteuthis n. g. M. & H. (1860.)**
Proc. Acad. Nat. Sci., Phila., for 1860, p. 176.
Phila., 1861. Meek & Hayden.
- *subovatus n. s.* M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860 p. 176.
Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebr.
- *subovata* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 505, 506,
pl. 33, fig. 3. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak.

Phymosoma (Haime) Desor. (1858.)

Synop. Echinoides Foss., p. 86. Paris and Wiesbade, 1858. E. Desor.

— **texanum** (Roemer sp.) Desor. (1858.)

Synop. Echinoides Foss., p. 90. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Fredericksburg, and San Saba river, Tex.

Physa (Draparnaud) White. (1876.)

Rep. Geol. Uinta Mts., p. 119. Wash., 1876. C. A. White.

— **atavus** n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 3, pp. 601, 602. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Dog creek, a tributary of the Upper Missouri river, Mont.

— **carletoni** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 508. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville, Utah.

— **carletoni** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 237. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **carletoni** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 306, 309, pl. 7, fig. 12a. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Carleton's coal mine, near Coalville, Utah.

— **carletoni** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 43, pl. 5, fig. 18. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **copei** n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 4, p. 602. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: South side of the Missouri river, near Cow island, Mont.

— **copei** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 85, pl. 24, figs. 4a, b. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near Cow island, Upper Missouri river, Mont.

— **copei** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 44, pl. 25, figs. 1, 2. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Physa—Continued.— **copei** (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 14, pl. 2, figs. 4, 4a. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bow river, eight miles west of Blackfoot crossing; Gooseberry canyon, St. Mary river, and St. Mary river, three miles north of the forty-ninth parallel; Pincher creek, crossing of Mill creek and Fort McLeod trail; High river, one mile below the forks; mouth of Blind Man river, Canada.

— **copei** (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 63. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, eight miles above the mouth of the Red Deer river; near Bull's head, Canada.

— **copei** (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 71. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, near its junction with the Bow river; south Saskatchewan, six miles below the mouth of the Bow river; South Saskatchewan, one mile below the mouth of the Bow river, Canada.

— **copei** var. **canadensis** n. var. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 14-16, pl. 2, figs. 5, 5a, b. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Pincher creek, crossing of Mill creek and Fort McLeod trail; Gooseberry canyon, St. Mary river; second or north branch of the Milk river, Canada.

— **felix** n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, p. 714. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Crow creek, Colo., ten miles above its confluence with the Platte.

— **felix** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 171. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colo.

— **felix** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 84, 85; pl. 22, fig. 1a. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, northern Colo.

— **felix** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 44, pl. 25, fig. 3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colo., east of the Rocky mountains.

Physa—Continued.

- **kanabensis** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 119. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Upper Kanab, Utah.
- **longinscula** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 119. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles above Fort Union.
- **nebrascensis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 119, 120. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union.
- **rhomboidea** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 119. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles above Fort Union.
- **subelongata** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 120. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Bad lands of the Judith.
- ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 237. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- ? White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 307, 308, pl. 7, fig. 13a. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Just northeastward from Coalville, Utah.
- ? White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 38, pl. 4, fig. 5. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- ? White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 43, pl. 6, fig. 17. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming.
- ? White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Part 1, p. 85, pl. 30, fig. 11a. Wash., 1883. C. A. White.
Formation: Cretaceous.
- Plestochilus** n. subgen. Meek. (1864.)
Check List Invert., Fos. N. Am. Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 37. Wash., 1864. F. B. Meek.
- Pinna** [Linn] Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 63. Phila., 1834. S. G. Morton.

Pinna—Continued.

- **aleutica** n. s. Eichwald. (1871.)
Geogr. Paleont. Bemerk. Halk. Mang. aleutischen Inseln, pp. 183, 184, Taf. 15, figs. 11, 12. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- **brewerii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 188, pl. 25, figs. 175, 175a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Curry's, south of Mount Diablo; Martinez; and Siskiyou mountains, Cal.
- **brewerii** Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 195, pl. 32, fig. 93. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
- **calamitoides** n. s. Shumard. (1858.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 124. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Nanaimo river, Vancouver island.
- **calamitoides** (Shum.) Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 167, 168, pl. 20, figs. 1, 1a, b. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands.
- **kingii** n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 131, 132, pl. 12, figs. 9, 9a. Wash., 1877. F. B. Meek.
Formation: Jurassic.
Location: Weber canyon, Wasatch range.
- **lakesi** n. s. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 181. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, Col.
- **lakesi** White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 17, 18, pl. 11, figs. 1a, b. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, about sixteen miles westward from Greeley, and about six miles southward from Fort Collins, Colo.
- **lakesii** (White) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 84. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South branch of the south fork of the Old Man river, Canada.
- **laquata** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 328. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.

Pinna—Continued.

- **laqueata** (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 81, 82, pl. 16,
figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington and Haddonfield, N. J.
- **? lingula n. s.** Newberry. (1861.)
Rep. Colo. River of the West, pt. 3, pp. 119, 120.
Wash., 1861. J. S. Newberry.
Formation: Cretaceous.
Location: At Oraybe, one of the Moqui villages.
- **petrina n. s.** White. (1874.)
Prelim. Rep. Geogr. and Geol. Expl. and Sur.
west of one-hundredth meridian, G. M. Wheel-
er, pp. 24, 25. Wash., 1874. C. A. White.
Formation: Cretaceous.
Location: East of Mount Taylor, one mile south
of Pajuate, N. Mex.
- **petrina** White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-
hundredth meridian, vol. 4, pt. 1, pp. 182, 183,
pl. 13, figs. 7a, b. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: East of Mount Taylor, one mile south
of Pajuate, N. Mex.
- **rostriformis n. s.** Morton. (1841.)
Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843,
p. 132. Phila., 1843. S. G. Morton.
Formation: Cretaceous.
Location: Timber creek, Gloucester county, N. J.
- **rostriformis** Morton. (1842.)
Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-
1842, p. 214, pl. 10, fig. 5. Phila., 1839-1842.
S. G. Morton.
Formation: Cretaceous.
Location: Timber creek, Gloucester county, N. J.
- **rostriformis** (Morton) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 198, pl. 16, figs.
3, 4. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Timber creek, N. J.
- **stevensoni n. s.** White. (1880.)
Proc. U. S. Nat. Mus., vol. 3, pp. 47, 48. Wash.,
1880. Smithsonian. Misc. Coll., vol. 22. Wash.,
1882. C. A. White.
Formation: Cretaceous.
Location: One and one-half miles southwestward
from Fort Wingate, N. Mex.
- **subcancellata n. s.** Whiteaves.
(1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 403.
Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Falls of the Iltasyouco river.
- **subcancellata** Whiteaves. (1878.)
Geol. Sur. Can., Rep. Prog. for 1876, 1877, p. 153.
Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Falls of the Iltasyouco river, British
Columbia.

Pinna—Continued.

- **sp. undet.** Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 286. New
Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: United States.
- **sp. undet.** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 63. Phila.,
1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey and Alabama.
- **sp. undet.** Roemer. (1849.)
Texas, p. 402. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **sp. undet.** Roemer. (1852.)
Kreide von Tex., p. 56. Bonn, 1852. F. Roe-
mer.
Formation: Cretaceous.
Location: Ravine three miles from New Braun-
fels, on road to Seguin, Tex.
- **sp. undet.** Roemer. (1852.)
Kreide von Tex., p. 56. Bonn, 1852. F. Roe-
mer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **sp. undet.** Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 268. Phila.,
1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de la Conchas, near Arivechi,
Sonora, Mex.
- **sp. undet.** Gabb. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 14.
Phila., 1870. W. M. Gabb.
Formation: Jurassic.
Location: Mormon station, Plumas county, Cal.
- **? White.** (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 234. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **sp. undet.** Hill. (1889.)
Geol. Sur. Tex., Bull. No. 4, p. 10. Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: Fort Worth, Tex.
- **sp. undet.** Hill. (1889.)
Geol. Sur. Tex., Bull. No. 4, p. 10. Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: Austin, Tex.
- Pirenella** (subgen. Gray) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 558. Wash.,
1876. F. B. Meek.
- Pisidium** (Pfeiffer) White. (1876.)
Rep. Geol. Uinta Mts., p. 128. Wash., 1876. C.
A. White.

Pisidium—Continued.

- **saginaturn** n. s. White. (1876.)
Rep. Geol. Unita Mts., p. 128. Wash., 1876. C. A. White.
Formation: Tertiary [Cretaceous].
Location: Almy coal mines, near Evanston, Wyo.
- **saginaturn** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyoming, Evanston coal mines.
- **saginaturn** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 34, pl. 20, figs. 14, 15. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Near Evanston, Wyo.

Pitar (subgen. Roem.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 179. Wash., 1873. F. B. Meek.

Placenticerus Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 462-464. Wash., 1876. F. B. Meek.

— **Meek typical.** (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 463. Wash., 1876. F. B. Meek.

— **glabrum** n. s. Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 172-174, pl. 24, figs. 1, 1a, b. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Peace river, a few miles below Fort Vermilion, Northwest Territory.

— **lenticulare** (Owen) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 186. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, at the mouth of the Saint Vrain, and in the valleys of the Cache à la Poudre, and Little Thompson creek, Colo.

— **occidentale** n. s. Whiteaves. (1887.)
Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886. App. I, p. 113 B. Montreal, 1887. J. F. Whiteaves.
Formation: Cretaceous.
Location: K-uk river, coast of British Columbia.

— **occidentale** Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 155, 156, pl. 21, fig. 1. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: K-uk river, coast of British Columbia.

— **perezianum** Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 156, 158. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Liard river, below Old Fort Halkett, latitude 59° 26' N., longitude 124° 48' W., Canada.

Placenticerus—Continued.

— (**perezianum** ? var.) **liardense** n. var. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 158, pl. 20, figs. 1, 2. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Liard river, near Old Fort Halkett, Canada.

— **placenta** (DeKay sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 465-468, pl. 24, figs. 2a, b, fig. 65, p. 466. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne river, Dak., Bear creek, a small tributary of Cheyenne river; North Red river, Minn.

— **placenta** var. White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear creek, near Morrison, Colo.

— **placenta** (DeKay sp.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 53, 54. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Branch of the Saskatchewan, White Mud river (or Frenchman's creek) on the forty-ninth Parallel; Blood Indian creek, longitude 111° west; St. Mary river, near its mouth; Belly river, west of St. Mary river; St. Mary river, west of MacLeod, Benton trail; lake south of Milk river; South Saskatchewan, opposite Swift Current creek, Red Deer river, above crossing of Lord Lorne trail, Canada.

— **placenta** (DeKay sp.) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 185. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

— **placenta** (DeKay sp.) Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 183. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Battle river, township 40, range 13, west of the fourth principal meridian; Sounding creek, township 30, range 8, west of the same meridian, Northwest Territory.

— **placenta** var. **intercalare** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 468-472, pl. 23, figs. 1a-c, fig. 66, p. 471. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Cheyenne river, at the mouth of Sage creek, Dak., Tarrant county, Tex.

Placenticerias—Continued.— **placenta** var. **intercalare** (Meek)
Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 54. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: St. Mary river; Berry creek, township 25, range 12, west of the fourth principal meridian, Canada.

— **? vancouverense** Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 370, 371, pl. 6, figs. 1, 1a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Komooks, Vancouver island.

— (**Sphenodiscus**) **lenticulare** (Owen)
Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 473, 476, pl. 34, figs. 1a-c, fig. 66, p. 473. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

Placento [i] **ceru** [a] s. n. g. Meek.
(1870.)

Proc. Am. Philos. Soc., vol. 11, 1869-1870, p. 429. Phila., 1871. F. B. Meek.

Placuna (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 62. Phila., 1834. S. G. Morton.

— **scabra** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 62. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Placunanomia (Brod.) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290. Phila., 1858-1860. T. A. Conrad.

— **lineata** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 291, pl. 46, fig. 20. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tennessee.

— **saffordi** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 290, 291, pl. 46, fig. 21. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tennessee.

Placunopsis (Morris & Lycett) White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 278. Wash., 1879. C. A. White.

— **hilliardensis** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 249. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Hilliard station, Wyo.

Placunopsis—Continued.— **hilliardensis** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 278, 279, pl. 7, fig. 14. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Hilliard station, Wyo.

Plagiarca n. subgen. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 4. T. A. Conrad.

Plagioptychus (?) **cordatus** n. s. Roemer.
(1888.)

Paleont. Abhandl. Vierter Band, Heft 4, pp. 13, 14, Taf. II, [xxxii], figs. 2a-2e. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Bartons creek, near Austin, Tex.

Plagiostoma [Sowerby] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 59. Phila., 1834. S. G. Morton.

— **annulatus** n. s. Trask. (1856.)

Proc. Cal. Acad. Nat. Sci., vol. 1, 1st ed., p. 86, pl. 3, fig. 2. San Francisco, 1854-1857. J. B. Trask.

Formation: Cretaceous.

Location: San Pedro, Cal.

— **dumosum** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 59, 60, pl. 16, fig. 8, p. 60. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Bluff at St. Stephens, on the Tombekbe river [Alabama].

— **gregalis** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, pp. 292, 293, pl. 5, fig. 6. New Haven, 1833. S. G. Morton.

Formation: [Cretaceous].

Location: New Jersey.

— **gregale** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 60, 61, pl. 5, fig. 6. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Burlington county, N. J.

— **pedroana** n. s. Trask. (1856.)

Proc. Cal. Acad. Nat. Sci., vol. 1, 1st ed., p. 86, pl. 3, fig. 1. San Francisco, 1854-1857. J. B. Trask.

Formation: Cretaceous.

Location: San Pedro, Cal.

— **pelagica** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 293, pl. 5, fig. 2. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **pelagicum** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 61, pl. 5, fig. 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Plagiostoma—Continued.— **truncata** n. s. Trask. (1856.)

Proc. Cal. Acad. Nat. Sci., vol. 1, 1st ed., p. 86, pl. 3, fig. 3. San Francisco, 1854-1857. J. B. Trask.

Formation: Cretaceous.

Location: San Pedro, Cal.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Planorbella (subgen. Hald.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 536. Wash., 1876. F. B. Meek.

Planorbis (Müller) M. & H. (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, pp. 106, 107. Wash., 1865. Meek & Hayden.

— (Müller typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 535. Wash., 1876. F. B. Meek.

— **amplexus** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 135, 136. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

— **convolutus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 120. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Little Horn river.

— **convolutus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 536, 537, pl. 42, figs. 12a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Little Horn and Powder rivers, Mont.

— **convolutus** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 83. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **convolutus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 41, pl. 27, fig. 16. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **convolutus** var. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 538, pl. 42, figs. 11a-e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Little Horn and Powder rivers, Mont.

— **fragilis** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 136. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Fort Berthold, on the Missouri river, Nebr.

Planorbis—Continued.— **paucivolvis** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 71, pl. 10, fig. 5. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, near its junction with the Bow river; South Saskatchewan, six miles below the mouth of Bow river, Canada.

— **subumbilicatus** n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 120. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Three miles below Fort Union.

— **tenuivolvis** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 135. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

— **veternus** (M. & H.) (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, p. 107, pl. 4, figs. 1, 1a, b. Wash., 1865. Meek & Hayden.

Formation: Jurassic? [Jurassic].

Location: Southwest base of the Black hills.

— **veternus** (M. & H.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog., for 1876-1877, p. 156. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyauco river, British Columbia.

— **veternus** (M. & H.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, pp. 406, 407. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— **veternus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 40, pl. 3, fig. 6. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Vicinity of the Black hills.

— **veternus** (M. & H.?) White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 21, pl. 4, figs. 20, 21. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Eight miles north of Canyon city, Colo.

— (**Bathyomphalus**) **amplexus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 539, pl. 42, figs. 16a, b, b, d, e. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near the mouth of Judith river, on the Missouri in Montana.

— (**Bathyomphalus**) **amplexus** (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 83. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Planorbis—Continued.— (*Bathyomphalus*) *amplexus* (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 41, pl. 27, figs. 19, 20. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Judith river beds.

— (*Bathyomphalus*) *kanabensis* n. s. White. (1876.)

Rep. Geol. Uinta Mts., p. 119. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, Utah.

— (*Bathyomphalus*) *kanabensis* White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 41, pl. 27, figs. 21, 23. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southern Utah.

— (*Gyraulus*) *militaris* n. s. White (1880.)

Proc. U. S. Nat. Mus., vol. 3, pp. 159, 160, Wash., 1880, Smithsonian Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Formation: Cretaceous.

Location: Head of Soldier's fork, Utah.

— (*Bathyomphalus*) *planoconvexus* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 538, 539, pl. 44, figs. 9a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Berthold, Dak., on the Missouri river.

— (*Bathyomphalus*) *planoconvexus* (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 83. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— (*Bathyomphalus*) *planoconvexus* (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 41, pl. 27, figs. 17, 18. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Fort Union beds.

— ? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Near Mellis station, Wyo.

Planorbulina ariminensis (d'Orb. sp.) Dawson. (1874.)

Canadian Naturalist, vol. 7, n. ser., p. 255, fig. 1, d, p. 253. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: About twenty miles north of the forty-ninth parallel, on the escarpment called Pembina mountain, Manitoba.

Planorbulina—Continued.— *farcata* var. *ariminensis* (d'Orb.) Dawson. (1875.)

British and N. Am. Bound. Com., Rep. Geol. and Res. 49th par., p. 79, pl. 17, fig. 2c. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: Boyne river, Manitoba, Canada.

Planularia Morton. (1842.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 214. Phila., 1839-1842. S. G. Morton.

— *cuneata* n. s. Morton. (1842.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, pp. 214, 215, pl. 11, fig. 5. Phila., 1839-1842. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— *elongata* Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 10. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Planulina globigerina Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 26. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— *mississippiica* Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 41. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— *nebulosa* Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 35. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— *oligosticta* Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 43. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— *suboctonaria* Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 48. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Platytrochus Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 399. Phila., 1858-1860. W. M. Gabb.

— *speciosus* (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 399, 400, pl. 69, figs. 15-17. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, N. J.

Pleurites ? americanus Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 20. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Pleurocera coalescens n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band. Heft. 4, pp. 7, 8, Taf. 1 [xxx], fig. 3. Berlin, 1888. F. Roemer.
Formation: Cretaceous.

Location: Two miles above the mouth of Barton's creek, near Austin, Tex.

— strombiformis (Schloth.) Hill. (1888.)

Ann. Rep. Geol. Sur. Arkansas, for 1888, vol. 2, pp. 129, 130, pl. 2, figs. 1-7, 7a, 7b, 8-12, 12a; pl. 3, figs. 6, 6a, 6b, 6c. Little Rock, 1888. R. T. Hill.

Formation: Cretaceous.

Location: Gypsum bluff, Little Missouri river, Pike county, Ark.

— texana n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band. Heft. 4, p. 7, Taf. 1 [xxx], fig. 2. Berlin, 1888. F. Roemer.
Formation: Cretaceous.

Location: Two miles above the mouth of Barton's creek, near Austin, Tex.

Pleurolimnæa n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 533. Wash., 1876. F. B. Meek.

Pleuromya (Agas.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 178. Phila., 1869. W. M. Gabb.

— (?) carlottensis n. s. Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 57-59, pl. 9, fig. 8. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte island.

— carlottensis Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 170. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky Mountains, three miles north of the east end of Devil's lake, Northwest Territory.

— lævigata n. s. Whiteaves. (1887.)

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886, app. I, p. 113 B. Montreal, 1887. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nookneamish river, northwest end of Vancouver island.

— lævigata Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 155. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nookneamish river, northwest end of Vancouver island.

— newtoni n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont., Black Hills, pp. 20, 21. Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: Two miles south of Belle Fourche, Black hills, Dak.

Pleuromya—Continued.**— newtoni Whitfield.** (1880.)

Rep. Geol. Black Hills of Dakota, pp. 367, 368, pl. 5, figs. 19, 20. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.

Location: On top of the highest hills two miles south of the Belle Fourche river, near Bear Lodge butte, Black hills.

— papyracea n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 178, 179, pl. 29, fig. 66. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Cal.

— subcompressa (Meek) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 222, pl. 29, fig. 6. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay.

— subcompressa var. carlottensis Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 223, pl. 29, figs. 7, 7a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay; east end of Maud island; Felsites of Sigutlat lake and the Iltasyouco river, mainland of British Columbia.

— (subcompressa ? var.) lævigata n. var. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 224, 225, pl. 30, figs. 1, 1a-c. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay; east end of Maud island.

— subcompressa var. lævigata Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 249, pl. 33, fig. 3. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

— subelliptica (M. & H.) Whiteaves. (1878.)

Can. Nat., vol. 8, n. ser. No. 7, p. 406. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— subelliptica (M. & H.) Whiteaves. (1878.)

Geol. Sur. Can.; Rep. Prog. for 1876-1877, p. 155. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

— unionides (Roemer sp.) Whiteaves. (1878.)

Can. Nat., vol. 8, n. ser. No. 7, p. 406. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake and Iltasyouco river.

Pleuromya—Continued.— **unionides** (Roemer sp.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-1877, pp. 155, 156. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake and Iltasyouco river, British Columbia.

Pleurotoma (Lam.) Shumard. (1861.)

Proc. Bost. Soc. Nat. Hist., vol. 8, 1861-1862, p. 197. Boston, 1862. B. F. Shumard.

— **minor** n. s. E. & S. (1857.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 40, 41. St. Louis, 1856-1860. Evans & Shumard.

Formation: Cretaceous.

Location: Moreau and Grand rivers.

— **mullicaensis** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 95, pl. 2, fig. 8. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Mullica hill, N. J.

— **texana** n. s. Shumard. (1861.)

Proc. Bost. Soc. Nat. Hist., vol. 8, 1861-1862, p. 197. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Red river, Lamar county, Tex.

Pleurotomaria (Def.) Shumard. (1861.)

Proc. Bost. Soc. Nat. Hist., vol. 8, 1861-1862, p. 198. Boston, 1862. B. F. Shumard.

— **austinensis** n. s. Shumard. (1861.)

Proc. Bost. Soc. Nat. Hist., vol. 8, 1861-1862, p. 198. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Austin, Tex.

— **rhodani** (d'Orb.) Eichwald. (1871.)

Geogr. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 119. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— **skidegatensis** n. s. Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 51-53, pl. 9, figs. 6, 6a. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **skidegatensis** Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 249. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

— **sp. undet.** Roemer. (1849.)

Texas, p. 414. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, near New Braunfels, Tex.

— **sp. undet.** Roemer. (1852.)

Kreide von Tex., p. 39. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe, near New Braunfels, Tex.

Pleurotomaria—Continued.— **sp. undet.** Roemer. (1852.)

Kreide von Tex., p. 39. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp, on the Guadalupe, above New Braunfels, Tex.

— **sp. undet.** Haughton. (1856.)

Jour. Roy. Dublin Soc., vol. 1, No. 4, p. 245, pl. 9, fig. 8. Dublin, 1858. S. Haughton.

Formation: Jurassic.

Location: Point Wilkie, Prince Patrick's land.

— ? **Gabb.** (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 307, pl. 48, fig. 28. Phila., 1858-1860. W. M. Gabb.

Formation: Triassic?

Location: Bath county, Va.

Plicatula (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 62. Phila., 1834. S. G. Morton.

— **arenaria** n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, pp. 126, 127, pl. 1, figs. 5a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Covero.

— **hydrotheca** n. s. White. (1876.)

Rep. Geol. Uinta Mts., p. 113. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Head of Water pocket canyon, southern Utah.

— **hydrotheca** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 279, pl. 6, figs. 3a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Head of Water pocket canyon, southern Utah.

— **incongrua** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 153, pl. 6, figs. 10a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: [Texas.]

— **perimbricata** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 16, 17, pl. 6, fig. 15a. Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nev.

— **placunea** ? (d'Orb.) Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 7. Austin, 1889. R. T. Hill.

Formation: Cretaceous.

Location: Washita beds from Fort Worth to Denison, Tex.

— **saffordi** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 283, pl. 46, fig. 34. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tennessee.

Plicatula—Continued.— **tetrica** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 283, pl. 46, fig. 26. Phila., 1858-1860.
T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— **urticosa** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 62, pl. 10, fig. 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey and Alabama.

— **urticosa** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 61, pl. 9, figs. 1, 2. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Freehold and Holmdel, N. J.

— **variata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 203, pl. 26, fig. 190. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Battle creek, Shasta county, Cal.

Pliophloe n. g. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 150. Phila., 1862-1863. Gabb & Horn.

— **sagena** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, pp. 150, 151, [pl. 20], fig. 34. Phila., 1862, 1863. Gabb & Horn.

Formation: Cretaceous.

Location: Timber creek, and near Mullica hill, N. J.

— **sagena** (G. & H.) Cook. (1868.)

Ann. Rep. Geol. Sur., New Jersey, for 1868, p. 376, fig. —. Newark, 1868. G. H. Cook.

Formation: Cretaceous.

Location: New Jersey.

Pollicipes maximus (Sow.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 241. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Turtle hill, N. J.

Polorthus n. g. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 366, 367. Phila., 1862. W. M. Gabb.

— **americana** Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 367. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Alabama and Mississippi, Timber creek, N. J.

— **americanus** Gabb. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, pp. 260-262, pl. 8, fig. 8. Phila., 1872. W. M. Gabb.

Formation: Cretaceous.

Location: [New Jersey.]

— **tibialis** (Morton sp.) Gabb. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, pp. 259-262, pl. 8, figs. 1-7. Phila., 1872. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

Polymorphina (d'Orb.) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band XLIV, p. 338. Wien, 1862. A. E. Reuss.

— **subrhombica** n. s. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsab., 1861, Band XLIV, p. 339, Taf. VII, fig. 3. Wien, 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

Polynema n. subgen. Conrad. (1875.)

Rep. Geol. Sur., N. C., vol. 1, Raleigh, 1875. W. C. Kerr. App. A, p. 4. T. A. Conrad.

Polyrhytis n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 532. Wash., 1876. F. B. Meek.

Popanoceras mcconnelli n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 138-140, pl. 18, figs. 2, 2a, b, 3, 3a. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about twenty-five miles below Devil's Portage, Canada.

Portlandia (subgen. Morch.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 107. Wash., 1876. F. B. Meek.

Posidonia ovata n. s. Lea. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 73. Phila., 1857. Isaac Lea.

Formation: [Triassic].

Location: Phoenixville, Pa.

— **parva** n. s. Lea. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 73. Phila., 1856. Isaac Lea.

Formation: [Triassic].

Location: Phoenixville, Pa.

Posidonomya blatchleyi n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869-1870, pp. 13, 14, pl. 6, fig. 12. Phila., 1870. W. M. Gabb.

Formation: Triassic.

Location: New pass, west of Austin [Nev.].

— **daytonensis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 32, 33, pl. 6, fig. 32. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Eldorado canyon, Nev., near Dayton.

— **stalla** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 32, pl. 6, fig. 31. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Star canyon, Humboldt mining region, Nev.

— ? — **Lyell**. (1847.)

Quart. Jour. Geol. Soc. Lond., vol. 3, p. 275, fig. 6a. London, 1847. C. Lyell.

Formation: Jurassic? [Triassic].

Location: Near Blackheath, Va.

Posidonomya—Continued.

— (Bronn.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 32. Phila., 1864. W. M. Gabb.

— sp. undet. Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo 3, p. 656, Lam. 1, fig. 2. Mexico, 1880. S. Ramirez.

Formation: Cretaceous. [?]

Location: Sierra Mojada, Mexico.

Potamides (Bronn.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 130. Phila., 1864. W. M. Gabb.

— **diadema** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 130, pl. 20, fig. 85. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Cal.

— **tenuis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 130, 131, pl. 20, fig. 86. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, twelve miles north of Oroville, Butte county, Cal.

— **tenuis** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 121, pl. 15, figs. 8, 8a, b. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Denman island, southwest side of Denman island, Sucia islands.

— **tenuis** var. **nanaimoensis** n. var. Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 121, 122, pl. 15, figs. 9, 9a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island, Nanaimo river, Vancouver island.

Prionocyclus n. g. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 452-455. Wash., 1876. F. B. Meek.

— typical Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 453. Wash., 1876. F. B. Meek.

— ? **macombi** n. s. Meek. (1876.)

Rep. Expl. Exped. Santa Fe, N. Mex., to junction of Grand and Green rivers, pp. 132, 133, pl. 2, figs. 3a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Banks of Canadian.

— **wyomingensis** (Meek) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 440, 441, pl. 14, figs. 1-3. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the east fork of Beaver creek, near Camp Jenney, Black hills.

— **wyomingensis** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 35, 36, pl. 15, figs. 1a-e. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Valley of Medicine Bow river, Wyo.

Prionocyclus—Continued.— (**Prionotropis**) **woolgari** (Mant. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 455-457, pl. 7, figs. 1a-h, pl. 6, fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Southwest base of the Black hills, Dak.; northeastern Nebraska; Drift of northwestern Iowa; New Mexico; eight miles north of Fort Lyon, Colo.

— **Prionotropis** n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 453. Wash., 1876. F. B. Meek.

— **Proropocrus obtusus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 23, 24 ? Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **Protocardia** subgen. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 266. Phila., 1856. T. A. Conrad.

— (subgen. **Beyrich**) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 149. Wash., 1857. T. A. Conrad.

— (**Beyrich** typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 172. Wash., 1876. F. B. Meek.

— subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 215. Wash., 1876. F. B. Meek.

— **borealis** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 41, 42, pl. 6, figs. 1, 1a, 2, 2a, 3. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: St. Mary river, near its junction with the Belly river; St. Mary river, west of McLeod Benton trail; South Saskatchewan, opposite Swift Current creek; three miles north of Ross coulee, near Irvine station, on the Canadian Pacific railway, Canada.

— **borealis** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 177. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: "The Nose," township 27, range 8, west of the fourth principal meridian, Northwest Territory.

— **n. s. carolinensis** Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A., p. 7, pl. 2, fig. 21. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

— **hillana** (?) var. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 169. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.

Protocardia—Continued.

- *rara* (E. & S.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 183. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Little Thompson creek, Colo.
- *shumardi* M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 98, 99, figs. A and B, text. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills.
- *subquadrata* (E. & S. sp.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 183. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Little Thompson creek; mouth of Saint Vrain creek, Colo.
- *subquadrata* (E. & S.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 41, pl. 5, figs. 4, 4a. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South Saskatchewan, opposite Swift Current creek; Bull's head, about twenty-two miles west of the west end of the Cypress hills; three miles north of Ross coulee, near Irvine station, on the Canadian Pacific; four miles south of Battle river, township 38, between ranges 12 and 13, west of fourth meridian, Canada.
- *subquadrata* (E. & S.) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 177. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sounding creek, township 30, range 8, west of the fourth principal meridian, Northwest Territory.
- *subscitula* Meek. (1876.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 360, 361, pl. 3, figs. 4, 4a. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Komooks, Vancouver island.
- (*Leptocardia* ?) *pertenuis* (M. & H.) Meek (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 176, 177, figs. 13, 14, p. 176. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Deer creek, on the North Platte.
- (*Leptocardia*) *rara* (E. & S. sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 176, pl. 17, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: On the Yellowstone river, one hundred and fifty miles above its mouth.

Protocardia—Continued.

- (*Leptocardia*) *subquadrata* (E. & S. sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 175, pl. 29, figs. 8a-e. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Long lake, Fox hills, etc.
- (*Protocardia*) *salinaensis* Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 174, pl. 2, figs. 13a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Twelve miles southwest of Salina, Kans.
- Protocardium** (Beyrich) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 136. Wash., 1885. R. P. Whitfield.
- *hillanum* (Sow. sp.) Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 228, pl. 30, fig. 5. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East end of Maud island.
- *scitulum* (Meek sp.) Whiteaves. (1879.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 155. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Blunden point, Vancouver island, two miles and a quarter and two miles and a half up the Nanaimo river; Sucia islands.
- sp. undet. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 250, pl. 33, fig. 5. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Maud island.
- Psammobia** (Lam.) Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, p. 24. Wash., 1877. R. P. Whitfield.
- *cancellato-sculpta* n. s. Roemer. (1852.)
Kreide von Tex., p. 46, Taf. 6, figs. 10, a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New Braunfels, Tex.
- *obscura* n. s. White. (1889.)
Bull. U. S. Geol. Sur., No. 51, p. 61, pl. 10, figs. 4-6. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Palace camp and Carbonado, Wash.
- ? *prematura* n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, p. 24. Wash., 1877. R. P. Whitfield.
Formation: Jurassic.
Location: East of the Belle Fourche, Black hills, Dak.

Psammobia—Continued.— **? prematura** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 374, pl. 5, fig. 31. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near Bear lodge butte, Black hills.

— **sp. undet.** Roemer. (1849.)

Tex., p. 407. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waterfall near New Braunfels, Tex.

Pseudobuccinum n. g. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 140.

Phila., 1858. Meek & Hayden.

— **nebrascense** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 350, 351, pl. 31, figs. 5a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **nebrascensis** M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 140, 141. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau trading post and Fox hills, Nebr.

— **nebrascense** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 185. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Little Thompson creek, Colo.

Pseudocardia n. g. Conrad. (1866.)

Am. Jour. Conch., vol. 2, p. 103. Phila., 1866.

T. A. Conrad.

Pseudocidaris saussurei (de Loriol) Cotteau. (1890.)

Bull. Soc. Geol., France, 3d ser., vol. 18, p. 294.

Paris, 1890. Cotteau.

Formation: Cretaceous.

Location: San-Juan-Raya (Puebla), Mexico.

Pseudodiadema n. g. Desor. (1858.)

Synop. Echinoides Foss., pp. 63, 64. Paris and Wiesbade, 1858. E. Desor.

— **diatretum** (Morton sp.) Desor. (1858.)

Synop. Echinoides Foss., p. 73. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Gloucestershire, N. J.

— **texanum** (Roemer sp.) Desor. (1858.)

Synop. Echinoides Foss., p. 72. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Fredericksburg and San Saba valley, Tex.

Pseudoliva (Swains.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 99. Phila., 1864. W. M. Gabb.

Pseudoliva—Continued.— **lineata n. s.** Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 99, pl. 18, fig. 52. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Northeast of Martinez, Cal.

— **volutæformis n. s.** Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 99, pl. 28, fig. 212. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Fort Tejon, Cal.

Pseudomelania (?) sp. undet. Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 49, 50.

Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte island.

Pseudomonotis (Bronn.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 354. Wash., 1880. R. P. Whitfield.

— **(Eumicrotis) curta** (Hall) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 354-356, pl. 3, figs. 20-25. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Two miles south of the Belle Fourche river, near Bear Lodge butte; on Beaver creek; on Red canyon creek, near the Cheyenne; and in Redwater valley, Black hills.

— **(Eumicrotis) orbiculata n. s.** Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. region; Prelim. Rep. Paleont., Black Hills, p. 17.

Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: Redwater Valley, Black hills, Dak.

— **(Eumicrotis) orbiculata** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 356, 357, pl. 3, figs. 17-19. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Redwater valley, Black hills.

Pseudonautilus n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 491. Wash., 1876. F. B. Meek.

Pseudoptera n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 29. Wash., 1876. F. B. Meek.

Psilomya (subgen. Meek) White. (1874.)

Prelim. Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian. G. M. Wheeler, p. 26. Wash., 1874. C. A. White.

Pteria (Scopoli) M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 79. Wash., 1865. Meek & Hayden.

— **gastrodes** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Pteria—Continued.

- *haydeni* (H. & M.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 33, 34, pl. 16, figs. 2a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri, below Fort Pierre.
- *haydeni* (H. & M.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 180. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Mouth of Saint Vrain creek, Colo.
- *laripes* (Mort.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 69, 70, pl. 14, fig. 9. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Delaware?
- *linguiformis* (E. & S. sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 32, 33, pl. 16, figs. 1a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Great bend of the Missouri, below Fort Pierre, Sage creek, Fox hills, Long lake, etc.
- *linguiformis* (E. & S.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 180. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, Colo.
- *linguiformis* (E. & S.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- *linguiformis* (E. & S.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Sage creek, Colo.
- *linguiformis* (E. & S.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 384, 385, pl. 7, figs. 2, 3. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the South fork of the Cheyenne river, near French creek, and on Old Woman fork, Black hills.
- *linguiformis* (E. & S. sp.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 31. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Elbow of South Saskatchewan; South Saskatchewan, fifteen miles west of Swift Current creek; Bull's head, about twenty-two miles west of the west end of the cypress hills; three miles north of Ross coulee, near Irvine station, on the Canadian Pacific railway, Canada.

Pteria—Continued.

- *linguiformis* var. *subgibbosa* n. var. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 33, pl. 23, fig. 12. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Long lake.
- *linguiformis* var. *subgibbosa* (Meek) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 174. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Battle river, township 46, range 4, west of the fourth principal meridian, Northwest Territory.
- *navicula* n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 70, 71, pl. 14, fig. 8. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- *parkensis* White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 279, 280, pl. 3, fig. 3a. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: South of Grand river, Middle park, Colo.
- *petrosa* (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 68, 69, pl. 14, fig. 10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: At or near Keyport, N. J.
- ? *stabilitatis* n. s. White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 15, pl. 17, fig. 3a. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Collin county, Tex.
- (*Oxytoma*) *corneuiliana* (d'Orb.) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 166, 167, pl. 23, figs. 1, 1a, b. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.
- (*Oxytoma*) *erecta* n. s. White. (1880.)
Proc. U. S. Nat. Mus., vol. 3, pp. 157, 158. Wash., 1880. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.
Formation: Cretaceous.
Location: Lower Potato valley, Southern Utah.
- (*Oxytoma*) *erecta* White. (1881.)
Proc. U. S. Nat. Mus., vol. 4, p. 139, pl. 1, figs. 7, 8. Wash., 1881. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.
- (*Oxytoma* ?) *gastrodes* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 280, 281, pl. 10, fig. 1a. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.

Pteria—Continued.

— (*Oxytoma*) *munsteri* (Bronn) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.
Smithson. Misc. Coll., vol. 7, No. 177, p. 39
Wash., 1864. F. B. Meek.

Formation: Jurassic.

Location: Dakota; Idaho.

— (*Oxytoma*) *munsteri* (Goldf.) M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 80, 81, figs. A and B, text.
Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Wind river valley, Dak.

— (*Oxytoma*) *nebrascana* (E. & S.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 34-36, pl.
16, 3a, b; and pl. 28, fig. 11. Wash., 1876. F.
B. Meek.

Formation: Cretaceous.

Location: Fox hills, Moreau river, South Fork
of the Cheyenne, Milk river above Fort Union,
and on the Yellowstone.

— (*Oxytoma*) *nebrascana* (E. & S.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 180. Wash., 1879. C. A. White.

— (*Oxytoma*) *nebrascana* (E. & S.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 385, 386, pl.
7, fig. 4. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Sage creek, Black hills.

— (*Oxytoma*) *nebrascana* (E. & S.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 31. Montreal, 1885. J.
F. Whiteaves.

Formation: Cretaceous.

Location: "South Branch of the Saskatchewan,"
South Saskatchewan opposite Swift Current
creek, Canada.

— (*Oxytoma*) *nebrascana* (E. & S. sp.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can.
Paleont., vol. 1, pt. 2, p. 56. Montreal, 1885.
J. F. Whiteaves.

Formation: Cretaceous.

Location: Milk river ridge, Canada.

— (*Oxytoma*) *nebrascana* (E. & S.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 79. Montreal, 1885. J.
F. Whiteaves.

Formation: Cretaceous.

Location: Rocky spring ridge, near MacLeod-
Benton trail; Milk river, about three miles
west of crossing of MacLeod-Benton trail; and
west flank of West Butte, Mont., in the sweet
grass hills, near to the international boundary-
line.

Pteria—Continued.

— (*Oxytoma*) *salinensis* n. s. White. (1879.)

Proc. U. S. Nat. Mus., vol. 2, pt. 2. pp. 296, 297,
pl. 5, figs. 1, 2, Wash., 1880, Smithson. Misc.
Coll., vol. 19. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Saline county, Kans.

— (*Oxytoma*) *salinensis* White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 15, 16, pl. 16, figs. 2a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Saline county, Kans.

— (*Pseudoptera*) *fibrosa* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 36, 37, pl.
17, figs. 17a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Forks of Cheyenne river; on North
Platte river, near the mouth of Deer creek.

— (*Pseudoptera*) *fibrosa* (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 197, Wash., 1879, C. A. White.

Formation: Cretaceous.

Location: Bear creek, near Morrison, Colo.

— (*Pseudoptera*) *fibrosa* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 386, pl. 7, fig. 5.
Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Rapid
creek.

— (*Pseudoptera*) *fibrosa* (M. & H.) var. *Whiteaves*. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 32, 33, pl. 4, fig. 1. Mont-
real, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bow river, below Horseshoe bend,
Canada.

— (*Pseudoptera*) *propleura* (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 281-284, pl. 10, figs. 2a-c. Wash., 1879.
C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— (*Pseudoptera*) *propleura* (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— (*Pseudoptera*) *rhytophora* (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 234. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

Pteria—Continued.— (*Pseudoptera*) *sublævis* n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region;
Prelim. Rep. Paleont. Black Hills, p. 29. Wash.,
1877. R. P. Whitfield.

Formation: Cretaceous.

Location: Old Woman's fork, Black hills, Dak.

— (*Pseudoptera*) *sublævis* Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 387, pl. 7,
fig. 6. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Old Woman fork, Black hills.

Pterocereila n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, p. 36.
Wash., 1864. F. B. Meek.

— *tippana* (Con.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.,
Smithson. Misc. Coll., vol. 7, No. 177, p. 36.
Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Mississippi.

— *tippana* (Conrad) Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 147, pl. 14, fig. 20.
Phila., 1868. W. M. Gabb.

Formation: Cretaceous.

Pterodonta inflata (d'Orb.) Ramirez. (1880.)

An. Min. Fomento Rep. Mex., Tomo 3, p. 657,
Lam. 2-4. Mexico, 1880. S. Ramirez.

Formation: Cretaceous.

Location: Sierra Mojada, Mexico.

— ? sp. undet. Urquiza. (1882.)

An. Min. Fomento Rep. Mex., Tomo 7, p. 224,
fig. 13. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Cerro de los Guzmanes, Coalcoman district, state of Michoacan, Mexico.

Pteroperna — ? Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 403.
Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— (?) Whiteaves. (1878.)

Geol. Sur. Can.; Rep. Prog. for 1876-1877, p. 153.
Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

Ptiloteuthis n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 128. Phila.,
1869. W. M. Gabb.

— *foliatus* n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 128, 129, pl. 19,
fig. 4. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Shasta county, Cal.

Ptychoceras (d'Orb.) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861-1862,
p. 190. Boston, 1862. B. F. Shumard.

Ptychoceras—Continued.— *æquicostatus* n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 74, pl. 13, fig.
20. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Aldersons gulch, and Eagle creek, Shasta county, Cal.

— *aratus* n. s. Conrad. (1874.)

Seventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 455. Wash., 1874. T. A. Conrad.

Formation: Cretaceous.

Location: Trout creek, near Fairplay [Colo.].

— *crassum* n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region;
Prelim. Rep. Paleont. Black Hills, pp. 45, 46.
Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman's fork, Black hills.

— *crassum* Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 459, pl. 16,
figs. 3-5. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman fork, Black hills.

— *crassum* (Whitfield) Stanton. (1887.)

Proc. Colorado Sci. Soc., vol. 2, pt. 3, for 1887, pp.
185, 186. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

— *meekanum* n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur., Rocky Mt. region,
Prelim. Rep. Paleont. Black Hills, pp. 44, 45.
Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On Beaver creek, Black hills.

— *meekanum* Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 457, 458, pl.
16, figs. 1, 2. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Beaver Creek, Black hills.

— *mortoni* n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 134.
Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Great bend of the Missouri, Nebr.

— *mortoni* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 412, 413, pl.
20, figs. 4a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri river, below Fort Pierre.

— *mortoni* (M. & H.) Stanton. (1887.)

Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p.
186. [Denver, 1888.] T. W. Stanton.

Formation: Cretaceous.

Location: About five miles north of the town of Boulder, Colo.

— *texanus* n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p.
190. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Chatfield point and Corsicana, Navarro county, Tex.

Ptychoceras—Continued.— **vancouverense** n. s. Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, pp. 113, 114, pl. 14, figs. 3, 3a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Banks of the Trent river, Vancouver island.

— (**? Hamites**) **quadratus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 74, 75, pl. 15, fig. 21, pl. 14, figs. 21, a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, Butte county, Cal.

Ptychosyca n. g. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 294. Phila., 1876. W. M. Gabb.

— **inornata** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 295, pl. 17, figs. 2-4. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Ptygostomum senarium Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 27. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **quinarium** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 28. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

Pugnellus n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.

— **densatus** Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

— **hamulus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 124, 125, pl. 20, fig. 81; pl. 18, fig. 48. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Southwest of Martinez, Cal.

— **hamulus** Gabb. (1868.)

Am. Jour. Conch., vol. 4 p. 139, pl. 13, figs. 1-3. Phila., 1868. W. M. Gabb.

Formation: Cretaceous.

— **hamulus** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 162, 163, pl. 27, figs. 42, 42a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— **manubriatus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 125, 126, pl. 29, fig. 229. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Cottonwood creek, Siskiyou county, Cal.

Pugnellus—Continued.— **typicus** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 298.

Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— (**Gymnarus**) **manubriatus** Gabb. (1868.)

Am. Jour. Conch., vol. 4, p. 139, pl. 13, figs. 4, 5.

Phila., 1868. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— (**Gymnarus**) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 163, Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: California.

Pulvinites (Defrance) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 330. Phila., 1855-1858. T. A. Conrad.

— **argentea** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 330, pl. 34, fig. 5. Phila., 1855-1858.

T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **argentea** Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 298, pl. 46, fig. 51. Phila., 1858-1860.

T. A. Conrad.

Formation: Cretaceous.

— **argentea** Conrad. (1867.)

Am. Jour. Conch., vol. 3, pp. 9, 10. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

Pupa helicoides n. s. (M. & H.) (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, pp. 118, 119. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Three miles above Fort Union.

Purpura (Brug.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301. Phila., 1858-1860. W. M. Gabb.

— (**Morea**) **naticella** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301, pl. 48, fig. 15. Phila., 1858-1860.

W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

Purpuroidea (Lycett) Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94. Phila., 1861. W. M. Gabb.

— **? dubia** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94, pl. 2, fig. 11. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Mullica hill, N. J.

Pycnodonta vesicularis (Lam.) Cook. (1868.)

Ann. Rep. Geol. Sur. New Jersey for 1868, p. 374, fig. —. Newark, 1868. G. H. Cook.

Formation: Cretaceous.

Location: New Jersey.

— **vesicularis** n. var. Cook. (1868.)

Ann. Rep. Geol. Sur. N. J. for 1868, p. 374, fig. —. Newark, 1868. G. H. Cook.

Formation: Cretaceous.

Location: New Jersey.

Pyrgulifera Meek. (1876.)

Rep. Expl. Great Basin, Terr. Utah, p. 363. Wash., 1876. F. B. Meek.

— **humerosa** Meek. (1876.)

Rep. Expl. Great Basin, Terr. Utah, p. 363, pl. 5, figs. 6a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Bear river, near the mouth of Sulphur creek.

— **humerosa** Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 176-178, pl. 17, figs. 19, 19a; fig. 6, p. 177. Wash., 1877. F. B. Meek.

Formation: Cretaceous.

Location: Sulphur creek, near Bear river, Wyo.

— **humerosa** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 245. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

— **humerosa** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 96. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near the mouth of Sulphur creek, Wyo.

— **humerosa** (Meek) White. (1882.)

Proc. U. S. Nat. Mus., vol. 5, p. 98, pl. 3, figs. 10-12. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming; and Utah.

— **humerosa** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 54, pl. 6, figs. 4-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming and adjacent parts of Utah.

Pygurus (d'Orb.) Desor. (1858.)

Synop. Echinoides Foss., pp. 309, 310. Paris and Wiesbade, 1858. E. Desor.

— **geometricus** (Morton sp.) Desor. (1858.)

Synop. Echinoides Foss., p. 313. Paris and Wiesbade, 1858. E. Desor.

Formation: Cretaceous.

Location: Delaware.

— **geometricus** (Agas.) d'Orb.

Paleont. Française, Echinoides Irreguliers, Terr. Cret. t. Sixieme, pp. 313, 314, pl. 920, fig. 4. Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: Delaware canal.

Pyrifusus n. g. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332. Phila., 1855-1858. T. A. Conrad.

— (Conrad typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 344. Wash., 1876. F. B. Meek.

— **newberryi** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 81. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: West flank of West butte, Mont., in the Sweet Grass hills, and near the forty-ninth parallel.

— **subdensatus** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332, pl. 35, fig. 12. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— (**Neptunella**) **intertextus** (M. & H. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 348, 349, pl. 19, figs. 14a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles above its mouth.

— (**Neptunella**) **newberryi** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 346, 347, pl. 31, figs. 6a-f and fig. 39, p. 346. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fox hills, Moreau trading post, and Long lake, Dak.; also on the Yellowstone river, one hundred and fifty miles above its mouth.

— (**Neptunella**) **subturritus** (M. & H. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 347, 348, pl. 32, figs. 3a, b, and fig. 40, p. 347. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Grand river.

Pyrina (Desmoul.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 276. Phila., 1869. W. M. Gabb.

— **parryi** n. s. Hall. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, pp. 144, 145, pl. 1, figs. 1a-d. Wash., 1857. James Hall.

Formation: Cretaceous.

Location: Leon springs, El Paso road [Tex.].

— **parryi** (Hall) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 276. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mex.

- Pyrripora** (d'Orb.) G. & H. (1862.)
 Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 157. Phila., 1862, 1863. Gabb & Horn.
- **irregularis** G. & H. (1862.)
 Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 157 [pl. 20], fig. 40. Phila., 1862, 1863. Gabb & Horn.
 Formation: Cretaceous.
 Location: Timber creek and near Mullica hill, N. J.
- Pyropsis** (Conrad) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 368, 369. Wash., 1876. F. B. Meek.
- **alabamensis** Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, pp. 285, 286. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Mississippi; Vincentown, N. J.
- **bairdi** (M. & H. sp.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 369-371, pl. 31, figs. 10a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Fox hills and other localities near Moreau river.
- **bairdi** (M. & H. sp.) (Meek) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 284. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
- **bairdi** var. **rotula** n. var. Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 371, 372, pl. 31, figs. 10c, 47, p. 371. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Fox hills and other localities near Moreau river.
- **elevata** Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 284. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Burlington county, N. J.
- **richardsonii** (Tuomey sp.) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 284. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: New Jersey; Prairie bluff, Ala.; Pataula creek, Ga.
- **septemlivata** Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 285. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: New Jersey.
- ? **trochiformis** (Tuomey sp.) Gabb. (1876.)
 Proc. Acad. Nat. Sci., Phila., for 1876, p. 285. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: New Jersey; Uniontown, Ala.
- Pyrula bairdi** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 66. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Moreau river and Fox hills, Nebr.
- **glabra** n. s. Shumard. (1858.)
 Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 125. St. Louis, 1856-1860. B. F. Shumard.
 Formation: Cretaceous.
 Location: Nanaimo river, Vancouver island.
- **sp. undet.** Roemer. (1849.)
 Texas, p. 415. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall, near New Braunfels, Tex.
- **sp. undet.** Roemer. (1852.)
 Kreide von Tex., p. 37. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Waterfall of the Guadalupe, below New Braunfels, Tex.
- Quadrula** (subgen. Raf.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.
- Radioconcha** n. g. Conrad. (1869.)
 Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 47. Phila., 1870. T. A. Conrad.
- Radiolites** (Lam.) Barcena. (1877.)
 Am. Museo Nac. Mex., Tomo 1, p. 198, Mexico, 1877-1879. M. Barcena.
- **austinensis** Roemer. (1852.)
 Kreide von Tex., pp. 77-79, Taf. 6, figs. a-d. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Austin, Tex.
- **foliaceus** ? (Lam.) Urquiza. (1882.)
 An. Min. Fomento Rep. Mex., Tomo 7, p. 223, fig. 8. Mexico, 1882. M. Urquiza.
 Formation: Cretaceous.
 Location: Road to Rincon, Coalcoman district, State of Michoacan, Mexico.
- **mendozæ** n. s. ? Barcena. (1877.)
 An. Museo Nac. Mex., Tomo 1, pp. 198, 199, figs. 16, 17. Mexico, 1877-1879. M. Barcena.
 Formation: Cretaceous.
 Location: States of Queretaro, Michoacan, Vera Cruz, Guerrero, and San Luis Potosi, Mexico.
- **turbinatus** (Lam.) Urquiza. (1882.)
 An. Min. Fomento Rep. Mex., Tomo 7, p. 223, fig. 7. Mexico, 1882. M. Urquiza.
 Formation: Cretaceous.
 Location: Road to Rincon, Coalcoman district, State of Michoacan, Mexico.
- **sp. undet.** Roemer. (1852.)
 Kreide von Tex., p. 77. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Sabine creek between New Braunfels and Fredericksburg, Tex.
- Radix** (subgen. Montfort) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 532. Wash., 1876. F. B. Meek.

Radula (Klein) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99.
Phila., 1870. T. A. Conrad.

— acutilineata (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. '9, pp. 62, 63, pl. 9,
figs. 6, 7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— denticuticosta (Gabb sp.) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99,
pl. 9, fig. 17. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.

— oxypheura n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1, Raleigh, 1875.
W. C. Kerr. App. A, p. 2, pl. 1, fig. 5. T. A.
Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.

— pelagica (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 61, 62, pl. 9,
figs. 3-5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Holmdel and Freehold, N. J.

— reticulata (L. & F.) Whitfield. (1885.)

Mong. U. S. Geol. Sur., vol. 9, pp. 63, 64, pl. 9,
figs. 8, 9. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Upper Freehold, N. J.

Rapa (Klein) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 332. Phila., 1855-1858. T. A. Conrad.

— elevata n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 301, pl. 48, fig. 12. Phila., 1858-1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Near Burlington, N. J.

— pyruloidea n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94, pl.
2, fig. 4. Phila., 1861. W. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, N. J.

— supraplicata n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-
1858, p. 332, pl. 35, fig. 20. Phila., 1855-1858.
T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the
town of Ripley, Miss.

Remondia n. g. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 270. Phila.,
1869. W. M. Gabb.

— ferrissii n. s. Cragin. (1889.)

Bull. Washb. Col. Lab. Nat. Hist., vol. 2, No. 10,
p. 68. Topeka, 1889. F. W. Cragin.
Formation: Cretaceous.
Location: Kiowa county, near Belvidere, Kans.

Remondia—Continued.**— furcata n. s. Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, pp. 270, 271, pl. 36,
figs. 17, 17a. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi,
Sonora, Mex.

Reptescharella (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 146. Phila., 1862, 1863. Gabb & Horn

— prolifera n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 146, 147 [pl. 20], fig. 28. Phila., 1862,
1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill, N. J.

Reptescharipora (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 151. Phila., 1862, 1863. Gabb & Horn.

— marginata n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 151, 152 [pl. 20], fig. 35. Phila., 1862,
1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill, N. J.

Reptocelleporaria (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 131. Phila., 1862, 1863. Gabb & Horn.

— aspera n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 131, 132 [pl. 19], fig. 14. Phila., 1862,
1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek and near Mullica hill,
N. J.

Reptoflustrella (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, pp. 161, 162. Phila., 1862, 1863. Gabb &
Horn.

— ? heteropora n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862,
1863, p. 162 [pl. 20], fig. 50. Phila., 1862, 1863.
Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill and Timber creek,
N. J.

Reptomulticava (d'Orb.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 401. Phila., 1858-1860. W. M. Gabb.

— cepularis ? (Mort. sp.) G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 367.
Phila., 1861. Gabb & Horn.
Formation: Cretaceous.
Location: New Jersey.

— cepularis (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 401, pl. 68, figs. 33-35. Phila., 1858-
1860. W. M. Gabb.
Formation: Cretaceous.
Location: Timber creek, N. J.

Reptomulticava—Continued.— **cepcularis** G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 177. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek, N. J.

Requienia (Math.) Conrad. (1854.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 299. Phila., 1850-1854. T. A. Conrad.

— **patagiata** n. s. White. (1884.)

Bull. U. S. Geol. Sur., No. 4, pp. 6, 7, pl. 1, figs. 1-8, pl. 2, figs. 1-4. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Vicinity of Austin, Tex.

— **patagiata** (White) Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, pp. 12, 13, Taf. I [xxxI], fig. 16; Taf. III, [xxxIII], figs. 5a-c. Berlin, 1888. F. Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Barton's creek, near Austin, Tex.

— **senseni** Conrad. (1854.)

Jour. Acad. Nat. Sci. Phila., vol. 2, 2d ser., 1850-1854, p. 299, pl. 27, fig. 8. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Missouri river, Nebr.

— **texana** (Roem.) White. (1884.)

Bull. U. S. Geol. Sur., No. 4, p. 7, pl. 2, figs. 5-7. Wash., 1884. C. A. White.
Formation: Cretaceous.
Location: Vicinity of Austin, Tex.

Retelea (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 164. Phila., 1862, 1863. Gabb & Horn.

— **ovalis** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 164, [pl. 21], fig. 52. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Near Mullica hill, N. J.

Retepora (Lam.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.

— (Lam.) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 124. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Big Timber creek, Gloucester county, N. J.

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 288. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: Gloucester county, N. J.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 79, 80. Phila., 1834. S. G. Morton.
Formation: Cretaceous.

Reticulipora Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 400. Phila., 1858-1860. W. M. Gabb.

— **dichotoma** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 173 [pl. 21], fig. 64. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek, N. J.

— **sagena** n. s. G. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 366. Phila., 1861. Gabb & Horn.
Formation: Cretaceous.
Location: New Jersey.

— **sagena** (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 400, 401, pl. 69, figs. 30-32. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Timber creek, N. J.

— **sagena** G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 173. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek, N. J.

Rhodea (subgen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 555. Wash., 1876. F. B. Meek.

Rhynchonella (Fischer) Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 39. Phila., 1864. F. B. Meek.

— **æquiplicata** n. s. Gabb. (1864.)

Geol. Sur. Paleont., vol. 1, p. 35, pl. 6, figs. 37, 37a, b. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Cinnabar district, in the range east of the Humboldt mountains.

— **gnathophora** n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 39, 40, pl. 8, figs. 1a-f. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genesee valley, Plumas county, Cal.

— **gnathophora** ? (Meek) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 284, 285, pl. 7, fig. 6. Wash., 1877. Hall & Whitfield.
Formation: Jurassic.
Location: Flaming gorge, Uinta range, Utah.

— **halli** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 308, pl. 48, figs. 29a-c. Phila., 1858-1860. W. M. Gabb.
Formation: Triassic.
Location: Bath county, Va.

— **lingulata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 34, pl. 6, figs. 36, 36a, b. Phila., 1864. W. M. Gabb.
Formation: Triassic.
Location: Star canyon, Humboldt county, Nev.

Rhynchonella—Continued.

- **maudensis** n. s. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1,
pt. 3, p. 252, pl. 33, figs. 8, 8a, b. Montreal,
1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

- **myrina** n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
p. 284, pl. 7, figs. 1-5. Wash., 1877. Hall &
Whitfield.

Formation: Jurassic.

Location: Flaming Gorge, Uinta range, Utah.

- **myrina** (H. & W.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 247, pl. 3,
figs. 6, 7. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Red canyon, Black hills, Dak.

- **plicatilis** (Sow.) Eichwald. (1871.)

Geog. Paleont. Bemerk. Halb. Mang. aleutischen
Inseln, p. 200. St. Petersburg, 1871. Eich-
wald.

Formation: Cretaceous.

Location: Alaska.

- **whitneyi** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 204, 205, pl.
34, figs. 105a, b. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

- — **M. & H.** (1865.)

Paleont., Up. Missouri, Smithsonian. Cont. Knowl.,
vol. 14, No. 172, pp. 71, 72, pl. 3, fig. 4. Wash.,
1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Dakota
Territory.

- **sp. undet.** Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 177.
Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

- — **? White.** (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 36. Wash.,
1889. C. A. White.

Formation: Cretaceous.

Location: Sucia islands.

Rhynchopterus n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 31, 32. Phila.,
1864. W. M. Gabb.

- **obesus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 32, pl. 5, figs.
30, a, b. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Rattlesnake point, near Humboldt
city, Nev.

Rhytophorus Meek. (1876.)

Rep. Expl. Great Basin, Terr. Utah, p. 364.
Wash., 1876. F. B. Meek.

Rhytophorus—Continued.

- **(?) glaber** n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 69, 70, pl. 10, figs. 4,
4a-c. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, east side of Driftwood
bend, and Belly river near its junction with the
Bow river; south side of the Milk river, one
mile above Pa-kow-ki coulee; south Saskatche-
wan, one mile below the mouth of the Bow
river; Driftwood bend, Canada.

- **meekii** n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 118, 119. Wash., 1876.
C. A. White.

Formation: Cretaceous.

Location: Bear river valley, near Mellis station,
Wyo.

- **meekii** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

- **meekii** White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 82, 83, pl. 30, figs. 8a, b. Wash.,
1883. C. A. White.

Formation: Cretaceous.

Location: Near the mouth of Sulphur creek,
Bear river valley, Wyo.

- **meekii** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 38, pl. 8,
figs. 4, 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming.

- **priscus** Meek. (1876.)

Rep. Expl. Great Basin Terr. Utah, p. 364, pl. 8,
figs. 4a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous?

Location: Bear river, near mouth of Sulphur
creek.

- **priscus** Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 175, 176, pl. 17, figs. 6, 6a. Wash., 1877. F.
B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river,
Utah.

- **priscus** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 243. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

- **priscus** (Meek) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 82. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Near the mouth of Sulphur creek, in
the valley of Bear river, Wyo.

Rhytophorus—Continued.— **priscus** (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 38, pl. 8, figs. 2, 3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming.

Rimella ? (Agas.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331. Phila., 1855-1858. T. A. Conrad.

— (subgen. Agas.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 123. Phila., 1864. W. M. Gabb.

— **curviliratus** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 331, pl. 35, fig. 9. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **macilenta** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, pp. 19, 20, pl. 3, figs. 10-12. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: About two miles northward from New Idria, Fresno county, Cal.

Ringicula (Deshayes) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 192. Boston, 1862. B. F. Shumard.

— **acutispira** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 193, 194. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Lamar county, Tex.

— **pulchella** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 192, 193. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Chatfield point, Navarro county, Tex.

— **subpellucida** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 193. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Bluffs of Red river, Lamar county, Tex.

Ringinella (d'Orb.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 174. Phila., 1869. W. M. Gabb.

— **pinguis** Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 175. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

— **polita** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 174, 175, pl. 28, fig. 60. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: South of the road from Colusa to the Hot sulphur springs in the first range of foothills, Colusa county, Cal.

Risso cretacea n. s. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 100, 101, pl. 9, fig. 15. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

Robulina ? **denaria** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 39. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **ocellus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 47. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Rosalina (d'Orb.) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss., Sitzungsab., 1861, Band XLIV, p. 337. Wien., 1862. A. E. Reuss.

— **bosqueti** n. s. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss., Sitzungsab., 1861, Band XLIV, p. 337 [Taf. III, fig. 1]. Wien., 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

Rostellaria (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 48. Phila., 1834. S. G. Morton.

— **sp. Credner**. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 237. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: New Jersey.

— **americana** n. s. E. & S. (1857.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 42. St. Louis, 1856-1860. Evans & Shumard.

Formation: Cretaceous.

Location: Moreau and Grand rivers.

— **americana** (E. & S.) Meek. (1859.)

Northwest Terr. Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind, p. 184. Toronto, 1859. F. B. Meek.

Formation: Cretaceous.

Location: South branch of the Saskatchewan, Canada.

— **arenarum** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 292, pl. 5, fig. 8. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

— **arenarum** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 48, pl. 5, fig. 8. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

— **biangulata** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 65. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from its mouth, Nebr.

— **? collina** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 157, pl. 13, figs. 3a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Between Rio San Pedro and Rio Puercos.

Rostellaria—Continued.

- *fusiformis* n. s. H. & M. (1854.)
Mem. Am. Acad. Arts and Sci., vol. 5, n. s., p. 393,
pl. 3, figs. 10a, b. Cambridge and Boston, 1855.
Hall & Meek.
Formation: Cretaceous.
Location: Sage creek.
- *macroductila* n. s. Troost. (1840.)
Fifth Geol. Rep. Tennessee, p. 56. Nashville,
1840. G. Troost.
Formation: Cretaceous.
Location: Near Purdy, McNairy county, Tenn.
- *monopleurophila* n. s. Roemer.
(1888.)
Paleont. Abhandl. Vierter Band. Heft. 4, p. 16,
Taf. III [xxxiii], figs. 3a, 3b. Berlin, 1888. F.
Roemer.
Formation: Cretaceous.
Location: Two miles above the mouth of Barton's
creek, near Austin, Tex.
- *pennata* n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 48, pl. 19,
fig. 9. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Prairie bluff, Ala.
- *rostrata* n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 390, pl. 68, fig. 7. Phila., 1858-1860.
W. M. Gabb.
Formation: Cretaceous.
Location: Burlington county, N. J., and Prairie
bluff, Ala.
- *rostrata* (Mort.) Conrad. (1875.)
Rep. Geol. Sur. N. C., vol. 1, Raleigh, 1875, W.
C. Kerr, App. A, pp. 12, 13. T. A. Conrad.
Formation: Cretaceous.
Location: Snow hill, Greene county, N. C.
- ? *texana* n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
158, pl. 13, figs. 4a, b. Wash., 1857. T. A.
Conrad.
Formation: Cretaceous.
Location: Between Rio San Pedro and Rio Puer-
cos [Tex.].
- (*Rimella*) *canalifera* n. s. Gabb.
(1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 123, 124, pl.
29, fig. 228. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, and near Fort Tejon, Cal.
- (*Rimella*) *simplex* n. s. Gabb.
(1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 124, pl. 20,
fig. 80. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: San Diego; Clayton, Cal.
- sp. undet. Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 282. New
Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: Chesapeake and Delaware canal; Mul-
lica hill and other places in New Jersey.

Rostellaria—Continued.

- sp. undet. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 48. Phila.,
1834. S. G. Morton.
Formation: Cretaceous.
Location: Delaware.
- sp. undet. Roemer. (1849.)
Texas, p. 414. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- sp. undet. Roemer. (1849.)
Texas, p. 414. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall near New Braunfels, Tex.
- sp. undet. Roemer. (1852.)
Kreide von Tex., p. 38. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe below New
Braunfels, Tex.
- sp. undet. Roemer. (1852.)
Kreide von Tex., p. 38. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- Rostellites** n. g. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p.
268. Phila., 1856. T. A. Conrad.
- (Con.) Dall. (1890.)
Trans. Wag. Free Inst. Sci., Phila., vol. 3, p. 71.
Phila., 1890. W. H. Dall.
- *nasutus* Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 294.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Clay county, Ga.
- *texana* Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
158, pl. 14, figs. 2a, b. Wash., 1857. T. A.
Conrad.
Formation: Cretaceous.
Location: Eagle Pass [Tex.].
- *texana* (Con.) Dall. (1890.)
Trans. Wag. Free Inst. Sci., Phila., vol. 3, pp.
71-73. Phila., 1890. W. H. Dall.
Formation: Cretaceous.
Location: Eagle Pass, Tex.
- *texanus* n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 263.
Phila., 1856. T. A. Conrad.
Formation: Cretaceous.
Location: Eagle Pass, Tex.
- Rotalia** (Lam.) Reuss. (1861.)
Math.-Naturw. Cl. Kaiserl. Akad. Wiss., Sitz-
ungsb., 1861, Band XLIV, p. 336. Wien., 1862.
A. E. Reuss.
- *calcipara* Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 33. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Rotalia—Continued.

- **globulosa** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, figs. 31 and 45. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **globulosa** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 21. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **heptas** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 40. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **lenticulina** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 32. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **leptospira** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 32. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **mortoni** n. s. Reuss. (1861.)
Math.-Naturw. Cl. Kaiserl. Akad. Wiss., Sitzungsab., 1861, Band XLIV, p. 337, Taf. VIII, fig. 1. Wein., 1862. A. E. Reuss.
Formation: Cretaceous.
Location: New Jersey.
- **nonas** ? Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 36. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **senaria** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 30. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Rotalina — Lyell. (1844.)

- Quart. Jour. Geol. Soc., London, vol. 1, p. 64, figs. a, d, p. 64. London, 1845. Charles Lyell.
Formation: Cretaceous.
Location: Timber creek, N. J.

Rotundaria (subgen. Raf.) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, p. 514. Wash., 1876. F. B. Meek.

Sagrina longirostris Ehrenberg. (1854.)

- Mikrogeologie, Taf. 32, fig. 22. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Salenia mexicana n. s. Schlüter. (1887.)

- Verhandl. Naturhist. Vereines, Preuss, Rheinlande, 44 Jahrg. 1 Hälfte. Bonn, 1887. Sitzungsab., pp. 41, 42.
Formation: Cretaceous.
Location: Gold placers of Guadalupe, seventy-five miles east of Chihuahua, Mexico.

Salenia—Continued.

- **prestensis** (Desor) Cotteau. (1890.)
Bull. Soc. Geol. France, 3d ser., vol. 18, No. 4, pp. 294, 295. Paris, 1890. Cotteau.
Formation: Cretaceous.
Location: Placers de Guadalupe (Chihuahua).
- **prestensis** (Desor) Cotteau. (1890.)
Bull. Soc. Geol. France, 3d ser., vol. 18, pp. 294, 295. Paris, 1890. Cotteau.
Formation: Cretaceous.
Location: Placers de Guadalupe (Chihuahua), Mexico.
- Sanguinolaria** (Lam.) Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 277. Phila., 1858-1860. T. A. Conrad.
- **? caudata** n. s. White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 61, pl. 10, figs. 1-3. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Carbonado, Wash.
- **cretacensis** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 277, pl. 46, fig. 11. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- **oblata** n. s. Whitfield. (1876.)
Rep. Rec. Carroll Mont to Yellowstone National Park, p. 144, pl. 2, figs. 3, 4. Wash., 1876. R. P. Whitfield.
Formation: Cretaceous.
Location: Near the mouth of the Judith river.
- Saxicava** [Bellevue] Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 127. St. Petersburg, 1871. E. Eichwald.
- **jurassica** n. s. Whitfield. (1877.)
U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont., Black Hills, pp. 25, 26. Wash., 1877. R. P. Whitfield.
Formation: Jurassic.
Location: Redwater valley, Black hills, Dak.
- **jurassica** Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 376, 377, pl. 5, figs. 25-30. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Redwater valley, Black hills.
- **ungana** (Grew.) Eichwald. (1871.)
Geog. Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 127. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Unga island, Alaska.
- Scala** (Klein) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 296. Phila., 1876. W. M. Gabb.
- **(Opalia) annulata** (Morton) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 298. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.

Scala—Continued.— (**Opalia**) **cyclostoma** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 297
298. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.

— (**Opalia**) **thomasi** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 296,
297. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.

Scalaria [Lam.] Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, p. 196. Phila., 1827-1831. S. G. Morton.

— **albensis** (??) (d'Orb.) Whiteaves. (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 50, 51,
pl. 9, fig. 5. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.

— **annulata** n. s. Morton. (1830.)

Am. Jour. Sci. 1st ser., vol. 18, pl. 3, fig. 6. New
Haven, 1830. S. G. Morton.
Formation: Cretaceous.

— **annulata** Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, pp. 196, 197. Phila., 1827-1831. S. G.
Morton.
Formation: Cretaceous.
Location: Gloucester county, N. J.

— **annulata** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 47, 48, pl. 3,
fig. 10. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Gloucester county, N. J.

— **cerethiformis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 63.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau trading post, Nebr.

— **forsheyi** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp.
195, 196. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Chatfield point, Navarro county, Tex.

— **mathewsoni** (Gabb) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 45. Wash.,
1889. C. A. White.
Formation: Cretaceous.
Location: Sheep Jack island.

— **sillimani** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 47, pl. 13,
fig. 9. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Prairie bluff, Ala.

— **sillimani** ? (Mort.) Owen. (1860.)

Second Rep. Geol. Rec. Ark., pl. 8, fig. 7. Phila.,
1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.

Scalaria—Continued.— **texana** Roemer. (1852.)

Kreide von Tex., pp. 39, 40, Taf. 4, figs. 11a, b.
Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe, below
New Braunfels, Tex.

— (**Opalia**) **mathewsoni** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 128.
Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Sucia islands.

— (**Scala**) **bicarini** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 1861, 1862, pp.
197, 198. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Bluffs of Red river, Lamar county, Tex.

— (**Scala**) **lamarensis** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p.
197. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Bluffs of Red river, Lamar county, Tex.

— ? Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, pp. 281, 282. New
Haven, 1830. S. G. Morton.
Formation: [Cretaceous].
Location: Gloucester county, N. J.

— **sp. undet.** Roemer. (1849.)

Texas, p. 413. Bonn., 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall near New Braunfels, Tex.

— **sp. undet.** Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 17. Austin, 1889.
R. T. Hill.
Formation: Cretaceous?
Location: North of Webberville, Tex.

Scalpellum (Leach) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p.
199. Boston, 1862. B. F. Shumard.

— **conradi** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 179, pl.
5, figs. 3, 3a, b, 4. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Neighborhood of Vincentown, N. J.

— **inæquiplacatum** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p.
199. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Near Chatfield point, Navarro county,
Tex.

Scambula n. g. Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 48.
Phila., 1870. T. A. Conrad.

Scambula—Continued.

- *perplana* n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 48, pl. 9, figs. 7, 8. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- *perplana* (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 123, 124, pl. 18, figs. 8-10. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- Scaphites** (Park.) Morton. (1828.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 109. Phila., 1827-1831. S. G. Morton.
- *abyssinus* (Morton sp.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 51. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: White Mud river, about twenty miles west of the crossing of Wood mountains and Cypress hills trails, Canada.
- *conradi* (Morton sp.) Meek. (1859.)
Northwest Terr., Rep. Prog. Assin. and Saskat. Expl. Exped., H. Y. Hind., p. 185. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: South branch of the Saskatchewan, Canada.
- *conradi* (Morton) Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 429. Phila., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Fountain creek, Colorado city, Colo.
- *cuvieri* n. s. Morton. (1828.)
Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 109-115, pl. 7, fig. 1. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Deep cut of the Chesapeake and Delaware canal.
- *cuvieri* Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, pp. 280, 281. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: [Deep cut of the Chesapeake and Delaware canal?]
- *hippocrepis* (DeKay sp.) Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 41, 42, pl. 7, fig. 1. Phila., 1834. S. G. Morgan.
Formation: Cretaceous.
Location: Deep cut of the Chesapeake and Delaware canal.
- *iris* n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 335, pl. 35, fig. 23. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.

Scaphites—Continued.

- *larvæformis* n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 58. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: East base of the Black hills.
- *larvæformis* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 418, 419, pl. 6, figs. 6a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Eastern base of the Black hills.
- *mandanensis* (Morton sp.) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear and Ralston creeks, Colo.
- *nicolleti* (Morton sp.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 51, 52. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Creek twelve miles east of White Mud river (or Frenchman's creek), Old Wives creek, township 10, range 11, west of third principal meridian, Canada.
- *nodosus* (Owen) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 186. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Fossil ridge, Colo.
- *nodosus* (Owen) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 197. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear creek, near Morrison, Colo.
- *nodosus* (Owen) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 206, 207. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Sage creek, Colo.
- *nodosus* (Owen) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 441-443, pl. 13, fig. 12. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid creek, Black hills, Dak.
- *nodosus* (Owen) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 52. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South branch of the Saskatchewan; elbow of the South Saskatchewan; South Saskatchewan, mouth of Swift Current creek; west end of the Cypress hills, Canada.
- *nodosus* (Owen) Stanton. (1887.)
Proc. Colo. Sci. Soc., vol. 2, pt. 3, for 1887, p. 187. [Denver, 1888.] T. W. Stanton.
Formation: Cretaceous.
Location: About five miles north of the town of Boulder, Colo.

Scaphites—Continued.

- **nodosus** (Owen) Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 182. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: North Saskatchewan river, near the mouth of Moose Hill creek, Northwest Territory.
- **nodosus** var. **brevis** n. var. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 426-428, pl. 25, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, Mont., one hundred and fifty miles above its mouth.
- **nodosus** var. **brevis** (Meek) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., p. 443, pl. 13, figs. 8, 9. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: Cheyenne river, near Rapid creek, Black hills, Dak.
- **nodosus** var. **plenus** n. var. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 177, 178. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Yellowstone river, one hundred and fifty miles above the mouth, Nebr.
- **nodosus** var. **plenus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 429, 430, pl. 26, figs. 1a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, one hundred and fifty miles from its mouth.
- **nodosus** var. **quadrangularis** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 428, 429, pl. 25, figs. 3a-c; 2a-c, and fig. 4. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, Mont., one hundred and fifty miles above its mouth.
- **nodosus** var. **quadrangularis** (Meek) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 443, 444, pl. 13, figs. 10, 11. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, near Rapid and French creeks, and also from Old Woman fork, Black hills.
- **nodosus** ? var. Meek. (1859.)
N. W. Terr., Rep. Prog. Assin and Saskat. Expl. Exped., H. Y. Hind, p. 185, pl. 2, figs. 7, 8. Toronto, 1859. F. B. Meek.
Formation: Cretaceous.
Location: South branch of the Saskatchewan, Canada.

Scaphites—Continued.

- **quatsinoensis** Whiteaves. (1887.)
Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser. 1886, App. I, p. 114 B. Montreal, 1887. J. F. Whiteaves.
Formation: Cretaceous.
Location: East side of Winter harbor, Forward inlet, Quatsino sound, Vancouver island.
- **quatsinoensis** Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 158, 159, pl. 21, fig. 2. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: East side of Winter harbor, Forward inlet, Quatsino sound, Vancouver island.
- **reniformis** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 291. New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: United States.
- **reniformis** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 42, pl. 2, fig. 6. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: Near Bordentown, N. J.
- **semicostatus** n. s. Roemer. (1852.)
Kreide von Tex., p. 35, Taf. 1, fig. 5, a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of Guadalupe, New Braunfels, Tex.
- **subglobosus** n. s. Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, pp. 52, 53, pl. 7, fig. 3, and pl. 8. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: East branch of the Poplar river on the forty-ninth parallel, Old Wives creek, township 10, range 11, west of third principal meridian, Canada.
- **texanus** n. s. Roemer. (1852.)
Kreide von Tex., p. 35, Taf. 1, figs. 4a-c. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of the Guadalupe, New Braunfels, Tex.
- **ventricosus** n. s. H. & M. (1862.)
Proc. Acad. Nat. Sci., Phila., for 1862, p. 22. Phila., 1863. Meek & Hayden.
Formation: Cretaceous.
Location: Chippewa point, near Fort Benton, on the Upper Missouri.
- **ventricosus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 425, 426, pl. 6, figs. 7a, b, 8a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Chippewa point, near Fort Benton, on the Upper Missouri.

Scaphites—Continued.

- *vermiculus* n. s. Shumard. (1859.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 594, 595. St. Louis, 1856-1860. B. F. Shumard.
Formation: Cretaceous.
Location: Grayson county, about four miles north of Sherman, Tex.
- *vermiculus* (Shumard) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 39, pl. 18, fig. 8a. Wash., 1883. C. A. White.
- *vermiformis* n. s. M. & H. (1862.)
Proc. Acad. Nat. Sci., Phila., for 1862, pp. 22, 23. Phila., 1863. Meek & Hayden.
Formation: Cretaceous.
Location: Chippewa point, near Fort Benton, on the Upper Missouri.
- *vermiformis* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 423-425, pl. 6, figs. 4a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Chippewa point, near Fort Benton, on the Upper Missouri.
- *vermiformis* ? (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 86. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest branch of north fork of the Old Man river; entrance to the North Kootanie pass, Canada.
- *verrucosus* n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 189, 190. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Near Dresden, Navarro county, Tex.
- *warreni* n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 177. Phila., 1861. Meek & Hayden.
Formation: Cretaceous.
Location: Near the Black hills, Nebr.
- *warreni* (M. & H.) White. (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 200, 201, pl. 19, fig. 3a. Wash., 1875. C. A. White.
Formation: Cretaceous.
Location: Three miles southwest of San Mateo, N. Mex.
- *warreni* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 420-423, pl. 6, fig. 5, figs. 61-63, p. 421. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Medicine Bow river, and east of Fort Steele, Wyo.
- *warreni* (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 444-446, pl. 13, figs. 1-4. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: Outer edge of Camp Jenney, east fork of Beaver creek, Black hills, Wyo.

Scaphites—Continued.

- *warreni* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 86. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Highwood river, ten miles west of first fork; entrance to Kootanie pass; northwest branch of north fork of the Old Man river, about four miles below Oyster creek, Canada.
- *warreni* (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 82. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: West flank of West Butte, Montana, near the forty-ninth parallel; Rocky Spring ridge, near MacLeod, Benton trail, Canada.
- *wyomingensis* (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 446, 447, pl. 13, figs. 5-7. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Belle Fourche, and on the east fork of Beaver creek, Black hills.
- (*Ammonites* ?) *nodosus* n. s. Owen. (1852.)
Rep. Geol. Sur. Wis., Iowa, Minn., p. 581, pl. 8, fig. 4. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Sage creek, a southern tributary of the Cheyenne.
- (*Ammonites* ?) *comprimus* n. s. Owen. (1852.)
Rep. Geol. Sur. Wis., Iowa, Minn., p. 580, pl. 8, fig. 4. Phila., 1852. D. D. Owen.
Formation: Cretaceous.
Location: Fox hills, Nebr.
- (*Discoscaphites*) *abyssinus* (Mort. sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 441-443, pl. 35, figs. 2a, b, and 4. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river, Dak.
- (*Discoscaphites*) *cheyennensis* (Owen sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 437-441, pl. 35, figs. 3a-i. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Fox hills, Moreau and Cheyenne rivers, Dak.
- (*Discoscaphites*) *conradi* (Mort. sp.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 430-432, pl. 36, figs. 2a-e. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Fox hills, Long lake, Moreau river, and near the eastern base of the Black hills, Dak.

Scaphites—Continued.— (**Discoscaphites**) **conradi** var. **gulosus** (Mort.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 432, 433, pl. 36, fig. 1. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fox hills, Long lake, Moreau river, etc.

— (**Discoscaphites**) **conradi** var. **intermedius** n. var. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 433-435, pl. 34, figs. 3a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Dak.

— (**Discoscaphites**) **mandanensis** (Mort. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 443, 444, pl. 35, figs. 1a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Dak.

— (**Discoscaphites**) **nicolletii** (Mort. sp.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 435, 436, pl. 34, figs. 4a-c, 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Fox hills, Long lake, etc., Dak., and Yellowstone river, Mont.

— sp. undet. Roemer. (1849.)

Texas, pp. 415, 416, Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford near New Braunfels, Tex.

— sp. undet. Roemer. (1849.)

Texas, p. 416. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Ford near New Braunfels, Tex.

Schizodesma (Gray) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 306. Phila., 1876. W. M. Gabb.

— (subgen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 204. Wash., 1876. F. B. Meek.

— ? **appressa** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 306, 307. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Schloenbachia borealis n. s. ? Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 160-162, pl. 21, fig. 5. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rink rapids, on the Lewis river, a tributary of the Yukon, latitude 60° 20', longitude 136° 30', Northwest Territory.

— **borealis** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 170. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.

Schloenbachia—Continued.— **gracilis** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 171, pl. 23, figs. 2, 2a. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.

— **inflata** (Sow. sp.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 200. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet.

— **propinqua** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 247, 248, pl. 33, figs. 2, 2a-c. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island; east side of South bay, in Skidegate inlet.

Scobinella (Conrad) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 25. Wash., 1889. C. A. White.

— **dilleri** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 25, 26, pl. 4, figs. 1-3. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Little Cow creek valley eighteen miles east of Redding, Shasta county, Cal., also Curry's Canada, south of Mount Diablo, Cal.

Sconsia (Gray) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301, pl. 48, fig. 13. Phila., 1858-1860. W. M. Gabb.

— (subgen. Gray) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 104. Phila., 1864. W. M. Gabb.

— **alabamensis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 301, pl. 48, fig. 13. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluff, Ala.

Scutella (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 77. Phila., 1834. S. G. Morton.

— **caroliniana** n. s. Ravenel. (1841.)

Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843, p. 81. Phila., 1843. E. Ravenel.

Formation: Cretaceous [Tertiary].

Location: Cooper river, in St. Thomas parish, about seventeen miles from Charleston [S. C.].

— **crustuloides** n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig. 8. New Haven, 1833. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: Southern States.

— **crustuloides** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 77, pl. 15, fig. 10. Phila., 1834. S. G. Morton.

Formation: Cretaceous [Tertiary].

Location: South Carolina.

Scutella—Continued.

- **lyelli** (Conrad) Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 77, pl. 10, fig. 8.
 Phila., 1834. S. G. Morton.
 Formation: Cretaceous [Tertiary].
- **macrophora** n. s. Ravenel. (1841.)
 Proc. Acad. Nat. Sci., Phila., vol. 1, 1841-1843,
 pp. 81, 82. Phila., 1843. E. Ravenel.
 Formation: Cretaceous [Tertiary].
 Location: Cooper river, in St. Thomas parish,
 about seventeen miles from Charleston, [S. C.].
- **rogersi** n. s. Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 77, pl. 13, fig. 3.
 Phila., 1834. S. G. Morton.
 Formation: Cretaceous [Tertiary].
 Location: Monroe county, Ala.
- **rogersi** (Mort.) Agas. (1838.)
 Mong. d'Echinodermes Vivans et Fossiles, pp. 83,
 84, pl. 19a, figs. 1-4. Neuchatel, 1838. L. Agassiz.
 Formation: Cretaceous [Tertiary].
 Location: Alabama.
- Seila** (subgen. A. Adams) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 335. Wash.,
 1876. F. B. Meek.
- Sepia** [Linn.] Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 32. Phila.,
 1834. S. G. Morton.
 Formation: Cretaceous.
- Septifer** (Recluz) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1 p. 186. Phila.,
 1864. W. M. Gabb.
- **dichotomus** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 186, pl. 30, fig.
 261. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Near Fort Tejon, Cal.
- Septocardia** n. g. H. & W. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
 pp. 294, 295, Wash., 1877. Hall & Whitfield.
- **carditoidea** n. s. H. & W. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
 pp. 296, 297, pl. 7, fig. 25. Wash., 1877. Hall
 & Whitfield.
 Formation: Jurassic.
 Location: Shoshone springs, Augusta mountains,
 Nev.
- **typica** n. s. H. & W. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
 pp. 295, 296, pl. 7, figs. 26-29. Wash., 1877.
 Hall & Whitfield.
 Formation: Jurassic.
 Location: Shoshone springs, Augusta mountains,
 Nev.
- Serpula** [Linn.] Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 73, Phila.,
 1834. S. G. Morton.
- **barbata** n. s. Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 73, pl. 15,
 fig. 12. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Alabama.

Serpula—Continued.

- **habrogramma** n. s. Gabb. (1860.)
 Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
 1860, p. 398, pl. 68, fig. 16. Phila., 1858-1860.
 W. M. Gabb.
 Formation: Cretaceous.
 Location: Long Branch, N. J.
- **intrica** n. s. White. (1875.)
 Rep. Geogr. and Geol. Expl. and Sur. west of
 one-hundredth meridian, vol. 4, pt. 1, p. 205, pl.
 15, fig. 5a. Wash., 1875. C. A. White.
 Formation: Cretaceous.
 Location: Southeast of Paria, Utah.
- **semicoalita** n. s. Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
 vol. 1, pt. 2, p. 185, pl. 26, fig. 1. Montreal,
 1889. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Vermilion river, township 25, range 20
 W.; Swan river, township 35, range 29 W., Man-
 itoba.
- **? tenuicarinata** (M. & H.) Meek.
 (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 507, 508, pl.
 6, fig. 1. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Mouth of Vermilion river, Dak., on
 the Missouri.
- **? tenuicarinatus** n. s. M. & H. (1857.)
 Proc. Acad. Nat. Sci., Phila., for 1857, p. 134.
 Phila., 1858. Meek & Hayden.
 Formation: Cretaceous.
 Location: Mouth of Vermilion river, on the Mis-
 souri, Nebr.
- **triangularis** (Munst.) Credner.
 (1870.)
 Zeitsch. Deutsch. Geol. Ges. Band 22, p. 240. Ber-
 lin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: New Jersey.
- **rotula** (Mort. sp.) Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges. Band 22, p. 241. Ber-
 lin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: Timber creek, N. J.
- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 282. New
 Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: Two miles west of Long Branch.
- **sp. undet.** Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 73. Phila.,
 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: Near Deal, N. J.
- **sp. undet.** M. & H. (1865.)
 Paleont. Up. Missouri, Smithson. Cont. Knowl.,
 vol. 14, No. 172, p. 128, pl. 5, fig. 4. Wash., 1865.
 Meek & Hayden.
 Formation: Jurassic.
 Location: Southwest base of the Black hills.

Serpula—Continued.— ? *Gabb.* (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 276, pl. 36, fig. 11. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— — ? *Whiteaves.* (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 408. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— ? *Whiteaves.* (1878.)

Geol. Sur. Can., Rep. Prog. for 1876, 1877, pp. 157, 158. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

— *sp. undet. Urquiza.* (1882.)

An. Min. Fomento Rep. Mex., Tomo 7, p. 225, fig. 19. Mexico, 1882. M. Urquiza.

Formation: Cretaceous.

Location: Road to Rincon, Coalcoman district, State of Michoacan, Mexico.

— *sp. undet. Hill.* (1888.)

Ann. Rep. Geol. Sur. Ark. for 1888, vol. 2, p. 135. Little Rock, 1888. R. T. Hill.

Formation: Cretaceous?

Location: Arkansas.

Serrifusus subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 373. Wash., 1876. F. B. Meek.

— *dakotensis* var. *vancouverensis* n. var. *Whiteaves.* (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 119, 120, pl. 15, fig. 5. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island.

Siliqua (Mühlf.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 147. Phila., 1864. W. M. Gabb.

— *cretacea* (Gabb) *Whitfield.* (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 186, 187, pl. 25, figs. 9, 10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Burlington county, N. J.

— *oregonensis* n. s. *Gabb.* (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 147, pl. 29, fig. 237. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North side of the Siskiyou mountains, Oregon, near the toll house on the stage road.

Siliquaria (Schum.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 324. Phila., 1855-1858. T. A. Conrad.

— *biplicata* n. s. *Conrad.* (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, pp. 324, 325, pl. 34, fig. 17. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Sincyclonema ? (Meek) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99. Phila., 1870. T. A. Conrad.

— *simplicius* (Con.) *Gabb.* (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 319. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Sinistralia (subgen. H. & A. Ad.) *Meek.* (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 373. Wash., 1876. F. B. Meek.

Smilotrochus (E. & H.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 205. Phila., 1869. W. M. Gabb.

— ? *curtus* n. s. *Gabb.* (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 205, pl. 34, figs. 106, 106a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

— (?) *vancouverensis* n. s. *Whiteaves.* (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 178, pl. 20, figs. 7, 7a. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Southwest side of Hornby island.

Solarium (Lam.) Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94. Phila., 1861. W. M. Gabb.

— *abyssinus* n. s. *Gabb.* (1860.)

Proc. Acad. Nat. Sci. Phila. for 1860, p. 94, pl. 2, fig. 9. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

— *conoideum* (Fitt.) *Eichwald.* (1871.)

Geogr.-Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 156. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— *planorbis* n. s. *Roemer.* (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, pp. 15, 16, Taf. 1 [xxx1], figs. 14a-14c. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Barton creek, near Austin, Tex.

— *wallense* n. s. *White.* (1885.)

Bull. U. S. Geol. Sur., No. 22, p. 14, pl. 5, figs. 1, 2. Wash., 1885. C. A. White.

Formation: Cretaceous.

Location: Near the town of Wallala, Mendocino county, Cal.

Solecurtus (Tagelus) occidentalis *Whiteaves.* (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 178, 179, pl. 24, fig. 4. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Battle river, township 40, range 13, west of the fourth principal meridian, Northwest Territory.

Solemya [Lam.] Conrad. (1850.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 274. Phila., 1850-1854. T. A. Conrad.

— **bilix n. s. White. (1880.)**

Proc. U. S. Nat. Mus., vol. 3, p. 158. Wash., 1880. Smithsonian Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Formation: Cretaceous.

Location: About four miles north of Golden, Colo.

— **bilix White. (1881.)**

Proc. U. S. Nat. Mus., vol. 4, p. 139, pl. 1, fig. 9. Wash., 1881. Smithsonian Misc. Coll., vol. 22. Wash., 1882. C. A. White.

— **planulata n. s. Conrad. (1853.)**

Jour. Acad. Nat. Sci. Phila., vol. 2, 2d ser., 1850-1854, p. 274, pl. 24, fig. 11. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Monmouth county, N. J.; Alabama.

— **subplicata (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 129, pl. 28, fig. 19. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— **triasina n. s. Conrad. (1869.)**

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 102. Phila., 1870. T. A. Conrad.

Formation: Triassic.

Location: Near Perkiomen creek, Pa.

Solen (Linn.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 146. Phila., 1864. W. M. Gabb.

— **? dakotensis n. s. M. & H. (1857.)**

Proc. Acad. Nat. Sci., Phila., for 1857, p. 142. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Just below the mouth of Vermilion river, Nebr.

— **irradians n. s. Roemer. (1852.)**

Kreide von Tex., p. 45, Taf. 6, figs. 9a, b. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **parallelus n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, pp. 146, 147, pl. 22, fig. 117. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Bull head point, near Martinez; Marsh, east of Mount Diablo; Alizos creek, near Fort Tejon, Cal.

— **subplicatus n. s. M. & H. (1856.)**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 82. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau river, Nebr.

— **(Hypogella) cuneatus n. s. Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, pp. 175, 176, pl. 29, fig. 61. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

Solen—Continued.— **(Hypogella) diegoensis Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, p. 176. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

— **? sp. undet. Roemer. (1849.)**

Texas, p. 407. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Solena (Browne) Con. (1865.)

Proc. Acad. Nat. Sci., Phila., for 1865, p. 184. Phila., 1865. T. A. Conrad.

— **biplicata Con. (1865.)**

Proc. Acad. Nat. Sci., Phila., for 1865, p. 184. Phila., 1865. T. A. Conrad.

Formation: Cretaceous.

Solenoceras n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.

— **annulifer (Mort. sp.) Conrad. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

Solidula (Fischer) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 194. Boston, 1862. B. F. Shumard.

— **riddelli n. s. Shumard. (1861.)**

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 194. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Navarro county, Tex.

Solidulus (Fischer) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 334. Phila., 1855-1858. T. A. Conrad.

— **linteus n. s. Conrad. (1858.)**

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 334, pl. 35, fig. 10. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Solyma n. g. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 75. Phila., 1871. T. A. Conrad.

— **lineolata (Con.) Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, pp. 182, 183, pl. 25, figs. 11-13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **lineolatus n. s. Conrad. (1870.)**

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, pp. 75, 76, pl. 3, fig. 9. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **lineolatus (Con.) Gabb. (1876.)**

Proc. Acad. Nat. Sci., Phila., for 1876, p. 305. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Spatangus (Lam.) Morton. (1824.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 122, 123. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county, N. J.

— cor marinum ? (Park.) Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 199. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Gloucester county, N. J.

— cor marinum ? (Park.) Morton. (1830.)

Am. Jour. 1st ser., vol. 18, pl. 3, fig. 10. New Haven, 1830. S. G. Morton.

— parastatus n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— parastatus Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 77, 78, pl. 3, fig. 21. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie bluff, Ala.; Timber creek, N. J.

— stella n. s. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, p. 245, pl. 3, fig. 11. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

— stella Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 200. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

— ungula n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 24, p. 131, pl. 10, fig. 9. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: Deep cut of the Chesapeake and Delaware canal.

— ungula Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 78, pl. 10, fig. 6. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal.

— sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: Gloucester county, N. J.

— sp. undet. Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: Deep cut of the Chesapeake and Delaware canal.

Sphæra (Sow.) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 102. Wash., 1877. F. B. Meek.

Sphæra—Continued.**— whitneyi n. s. Meek. (1877.)**

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 102, pl. 10, figs. 4a-c. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Buena Vista canyon, West Humboldt range, Nev.

Sphærella n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 280. Phila., 1858-1860. T. A. Conrad.

— concentrica n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 280, pl. 46, fig. 4. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula [Ala.].

Sphæriola (Stoliczka) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 136, 137. Wash., 1876. F. B. Meek.

— ? cordata (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 137, 138, pl. 29, figs. 3a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

— ? endotrachys n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 139, pl. 29, fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Ninety miles below Fort Benton, on the Missouri.

— ? endotrachys (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 182. Wash., 1871. C. A. White.

Formation: Cretaceous.

Location: Valley of Little Thompson creek, Colo.

— ? obliqua n. s. Meek. (1875.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 1, No. 1, 2d ser., p. 46. Wash., 1875. F. B. Meek.

Formation: Cretaceous.

Location: Left-hand creek, halfway between Long Mont and Boulder city, Colo.

— ? obliqua (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 182. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Little Thompson creek, Colo.

— transversa n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, pp. 34, 35. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Old Woman's fork., Dak.

— transversa Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 145, pl. 10, figs. 14-16. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Old Woman's fork, Wyo.

Sphæriola—Continued.

- **umbonata** n. s. Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, p. 152, pl. 19, figs.
 17, 18. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: New Jersey.
- ? **warrenana** n. s. Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 138, 139.
 Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Near the eastern base of the Black
 hills.

Sphærium (Scopoli) Prime. (1865.)

- Mon. Am. Corbiculadæ (Recent and Fossil),
 Smithson. Misc. Coll., vol. 7, No. 145, pp. 32, 33.
 Wash., 1865. T. Prime.
- **formosum** (M. & H.) Prime. (1865.)
 Mon. Am. Corbiculadæ (Recent and Fossil),
 Smithson. Misc. Coll., vol. 7, No. 145, p. 59.
 Wash., 1865. T. Prime.
 Formation: Tertiary [Cretaceous].
 Location: Three miles above Fort Union, Nebr.
- **formosum** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 526, 527, pl.
 43, figs. 4a-c. Wash., 1876. F. B. Meek.
 Formation: Lower Eocene? [Cretaceous].
 Location: Ten miles below Fort Union.
- **formosum** (M. & H.) White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pt. 1, p. 72. Wash., 1883. C. A. White.
 Formation: [Cretaceous].
 Location: Upper Missouri river region.
- **formosum** (M. & H.) White. (1883.)
 Third Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
 p. 33, pl. 17, fig. 11. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Upper Missouri river region.
- **formosum** ? (M. & H.) Whiteaves.
 (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
 ont., vol. 1, pt. 1, p. 68. Montreal, 1885. J. F.
 Whiteaves.
 Formation: Cretaceous.
 Location: Belly river, east side of Driftwood bend,
 South Saskatchewan, one mile below the mouth
 of the Bow river, Canada.
- **formosum** ? (M. & H.) var. **White-**
eaves. (1885.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
 ont., vol. 1, pt. 1, pp. 61, 62, pl. 9, fig. 3. Mon-
 treal, 1885. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Ed. Mahan's coulee; Belly river, eight
 miles above Coal banks, Canada.
- **planum** n. s. M. & H. (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, pp. 175,
 176. Phila., 1861. Meek & Hayden.
 Formation: Tertiary [Cretaceous].
 Location: Near the mouth of Grand river, on the
 Upper Missouri, Nebr.

Sphærium—Continued.

- **planum** (M. & H.) Prime. (1865.)
 Mon. Am. Corbiculadæ (Recent and Fossil),
 Smithson. Misc. Coll., vol. 7, No. 145, p. 58.
 Wash., 1865. T. Prime.
 Formation: Tertiary [Cretaceous].
 Location: Near the mouth of Grand river, on the
 Upper Missouri, Nebr.
- **planum** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 526, pl. 43,
 figs. 6a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Near Grand island, on the upper Mis-
 souri.
- **planum** (M. & H.) White. (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pt. 1, p. 72. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Upper Missouri river region.
- **planum** (M. & H.) White. (1883.)
 Third Ann. Rep. U. S. Geol. Sur., p. 33, pl. 17, fig.
 8. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Upper Missouri river region.
- **recticardinale** n. s. M. & H. (1860.)
 Proc. Acad. Nat. Sci., Phila., for 1860, p. 176.
 Phila., 1861. Meek & Hayden.
 Formation: Tertiary [Cretaceous].
 Location: Near the mouth of Grand river, on the
 Upper Missouri, Nebr.
- **recticardinale** (M. & H.) Prime.
 (1865.)
 Mon. Am. Corbiculadæ (Recent and Fossil),
 Smithson. Misc. Coll., vol. 7, No. 145, p. 58.
 Wash., 1865. T. Prime.
 Formation: Tertiary [Cretaceous].
 Location: Near the mouth of Grand river, on the
 Upper Missouri, Nebr.
- **recticardinale** (M. & H.) Meek.
 (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 527, 528,
 pl. 43, figs. 3a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Near Grand island, on the Upper Mis-
 souri.
- **recticardinale** (M. & H.) White.
 (1883.)
 Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., pt. 1, p. 72. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Upper Missouri river region.
- **recticardinale** (M. & H.) White.
 (1883.)
 Third Ann. Rep. U. S. Geol. Sur., p. 33, pl. 17, fig.
 9. Wash., 1883. C. A. White.
 Formation: Cretaceous.
 Location: Upper Missouri river region.

Sphærium—Continued.**—recticardinale (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 9. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Old Man river, two miles above Rye-Grass flat, Canada.

—subellipticum (M. & H.) Prime. (1865.)

Mon. Am. Corbiculadæ (Recent and Fossil), Smithsonian. Misc. Coll., vol. 7, No. 145, p. 59. Wash., 1865. T. Prime.

Formation: Tertiary [Cretaceous].

Location: Three miles above Fort Union, Nebr.

—subellipticum (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 527, pl. 43, figs. 5a, b. Wash., 1876. F. B. Meek.

Formation: Lower Eocene? [Cretaceous].

Location: Ten miles below Fort Union, Nebr.

—subellipticum (M. & H.) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 72. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

—subellipticum (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 33, pl. 17, fig. 10. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— ? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Evanston coal mines, Wyo.

Sphenodiscus subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 463. Wash., 1876. F. B. Meek.

—mandensis n.s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 200, 201, pl. 22, figs. 3, 3a, b. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: East point of Maud island, in Skidegate inlet.

—requienianus ? (d'Orb.) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 248, pl. 22, figs. 4, 4a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Maud island.

Spirifer (Sow.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 35. Phila., 1864. W. M. Gabb.

Spirifer—Continued.**—homfrayi n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 35, pl. 6, fig. 38. Phila., 1864. W. M. Gabb.

Formation: Triassic.

Location: Star canyon, Humboldt county, Nev.

—obtusum n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 17, 18, pl. 7, figs. 16, a, b. Phila., 1870. W. M. Gabb.

Formation: Triassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nev.

Spirifera (Spiriferina ?) alia n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 281, 282, pl. 6, fig. 17. Wash., 1877. Hall & Whitfield.

Formation: Triassic.

Location: One and a half miles south of Dun Glen pass, Pah-Ute range, Nev.

Spiriferina (d'Orb.) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, p. 281. Wash., 1877. Hall & Whitfield.

—borealis n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 128, 129, pl. 17, fig. 1. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about twenty-five miles below Devil's portage, Canada.

—homfrayi ? (Gabb) H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, p. 281, pl. 6, fig. 18. Wash., 1877. Hall & Whitfield.

Formation: Triassic.

Location: One and a half miles south of Dun Glen pass, Pah-Ute range, Nev.

Spiroceras (Meek) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 198. Montreal, 1884. J. F. Whiteaves.

—carlottense n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 198, 199. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North shore of Cumshewa inlet.

Spirocrypta n. subgen. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 136, 137. Phila., 1864. W. M. Gabb.

Spiroonema n. g. Meek. (1864.)

Check List Invert. Foss. N. Am., Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 35. Wash., 1864. F. B. Meek.

—tenuilineata (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am., Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 35. Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Dakota.

Spironema—Continued.— **tenuilineata** (M. & H. sp.) Meek. (1876).

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 342, 343, pl. 32, fig. 9, a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Moreau river.

Spiroplecta americana Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 25. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

— **americana** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 13, 14. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.

— **rosula** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 26. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Spiropora (d'Orb.) G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 166. Phila., 1862, 1863. Gabb & Horn.

— **calamus** n. s. G. & H. (1862.)

Jour. Acad. Nat. Sci., Phila., vol. 5, 2d ser., 1862, 1863, p. 166 [pl. 21], fig. 55. Phila., 1862, 1863. Gabb & Horn.
Formation: Cretaceous.
Location: Timber creek, N. J.

Spirorbis (Lamarck) White. (1880.)

Proc. U. S. Nat. Mus., vol. 3, p. 161. Wash., 1880.
Smithson. Misc. Coll., vol. 22. Wash., 1882.
C. A. White.

— ? **dickhauti** n. s. White. (1880.)

Proc. U. S. Nat. Mus., vol. 3, p. 161. Wash., 1880.
Smithson. Misc. Coll., vol. 22. Wash., 1882.
C. A. White.
Formation: Cretaceous [Tertiary].
Location: Near Little Rock, Ark.

— ? (Lam.) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 121, 122. Phila., 1827-1831. S. G. Morton.
Formation: Cretaceous.
Location: Big Timber creek, Gloucester county, N. J.

— ? Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 282. New Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.

— ? White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 246. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Near Mellis station, Wyo.

Spondylus [Lam.] Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 274. Phila., 1850-1854. T. A. Conrad.

— **capax** n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 274, pl. 24, fig. 8. Phila., 1850-1854. T. A. Conrad.
Formation: Cretaceous.
Location: Nimrod Woodward's farm N. J.

— **gregalis** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 57, 58, pl. 9, figs. 11, 12, pl. 10, figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Upper Freehold, Monmouth county, N. J.

— **guadalupe** n. s. Roemer. (1849.)

Texas, p. 400. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Waterfall near New Braunfels, Tex.

— **guadalupe** Roemer. (1852.)

Kreide von Tex., pp. 62, 63, Taf. 8, figs. 9a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Waterfall of the Guadalupe and crossing of the Cibolo between New Braunfels and San Antonio, Tex.

— n. s. ? Hill. (1889.)

Geol. Sur. Tex., Bull. No. 4, p. 7. Austin, 1889. R. T. Hill.
Formation: Cretaceous.
Location: Two miles northwest of Austin, Tex.

Stalagmium n. subgen. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 281. Phila., 1858-1860. T. A. Conrad.

Stavella (subgen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 68. Wash., 1876. F. B. Meek.

Stearnsia n. g. White. (1887.)

Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, pp. 32, 33. Phila., 1887. C. A. White.

— **robinsi** n. s. White. (1887.)

Proc. Acad. Nat. Sci., Phila., pt. 1, for 1887, pp. 33, 34, pl. 2, figs. 7-9. Phila., 1887. C. A. White.
Formation: Cretaceous.
Location: Texas [Six miles north of Fort Worth].

Stephanoceras braikenridgii (?) (Sow. sp.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 407. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river.

— **braikenridgii** (?) (Sow. sp.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 156. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river, British Columbia.

Stephanoceras—Continued.— **cephoides** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 210. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South island, Skidegate inlet.

— **humphreysianum** (Sow. sp.) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 407.

Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake.

— **humphreysianum** (Sow. sp.) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-1877, p. 156.

Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake, British Columbia.

— **oblatum** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 209, 210. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Skidegate inlet, Queen Charlotte islands.

— (?) Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, p. 407.

Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— (?) Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876, 1877, pp. 156, 157. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

Stomatia (Lamarck) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 18. Wash., 1889. C. A. White.

— **obstricta** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 18, 19, pl. 4, figs. 10, 11. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Little Cow creek, Shasta county, Cal.

— **suciensis** n. s. Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 128, 129, pl. 16, fig. 4. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

— **suciensis** var. **carinifera** n. var. Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 128, 129, pl. 16, fig. 5. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

Straparollus (Montf.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 120. Phila., 1864. W. M. Gabb.

Straparollus—Continued.— **lens** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 120, 121, pl. 20, figs. 77a-d. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— **paucivolvus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 120, pl. 20, fig. 76. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

Straparolus (Montf.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 299. Phila., 1858, 1860. W. M. Gabb.

— **lpidosus** (Montf. sp.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 300, pl. 48, fig. 5a, b. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

— **subplanus** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 299, 300, pl. 48, figs. 4, a, b. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Prairie bluff, Ala.

Strepsidura (Swains.) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 286. Phila., 1858-1860. T. A. Conrad.

— **ripleyana** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 286, pl. 46, fig. 42. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

Striarca (subgen. Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 78. Wash., 1876. E. B. Meek.

Strombus (Linn.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 330. Phila., 1855-1858. T. A. Conrad.

— **densatus** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 330, pl. 35, fig. 14. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Strophoconus spicula ? Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 21. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

Surcula (H. & A. Ad.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 150. Phila., 1869. W. M. Gabb.

— (subgen. H. & A. Ad.) (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 381. Wash., 1876. E. B. Meek.

Surcula—Continued.

- *præattenuata* n. s. Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 150, pl. 26, fig. 27. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: San Diego, Cal.

— *raricostata* (Gabb.) var. *Whiteaves*. (1879.)

- Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 116, 117, pl. 15, figs. 2, 2a. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: West side of Hornby island, Nanaimo river, Vancouver island.

— *strigosa* n. s. Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, pp. 299, 280. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: Holmdale, N. J.

— *suciensis* n. s. *Whiteaves*. (1879.)

- Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 115, 116, pl. 15, figs. 1, 1a. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Sucia islands.

— (*Surculites*) [*io*] Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, p. 280. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: [California.]

— (*Surculites*) *inconspicua* n. s. Gabb. (1869.)

- Geol. Sur. Cal. Paleont., vol. 2, p. 151, pl. 26, fig. 29. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Martinez, Cal.

— (*Surculites*) *mathewsonii* (Gabb) sp.) Gabb. (1876.)

- Proc. Acad. Nat. Sci., Phila., for 1876, p. 280. Phila., 1876. W. M. Gabb.
 Formation: Cretaceous.
 Location: [California.]

— (*Surculites*) *sinuata* Gabb. (1869.)

- Geol. Sur. Cal. Paleont., vol. 2, pp. 150, 151 pl. 26, fig. 28. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Tejon; Canada de las Uvas and Arroyo de los Alizos, Cal.

Surculites (subgen. *Conrad*) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, p. 382. Wash., 1876. F. B. Meek.

Sycodes n. g. Gabb. (1869.)

- Geol. Sur. Cal. Paleont., vol. 2, p. 160. Phila., 1889. W. M. Gabb.

— *cypræoides* Gabb. (1869.)

- Geol. Sur. Cal. Paleont., vol. 2, p. 160. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: California.

Sycodes—Continued.

— (?) *cypræoides* ? (Gabb.) *Whiteaves*. (1874.)

- Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 262. Montreal, 1874. J. F. Whiteaves.
 Formation: Cretaceous.

- Location: Nanaimo river, Vancouver island, two and one-half and two and one-quarter miles up.

— (?) *cypræoides* (?) (Gabb.) *Whiteaves*. (1874.)

- Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 263. Montreal, 1874. J. F. Whiteaves.
 Formation: Cretaceous.

- Location: Protection island.

— *glaber* (Shum. sp.) *Whiteaves*. (1879.)

- Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 125. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.

- Location: Protection island; Nanaimo river, two miles and a quarter up, Vancouver island, Sucia islands.

Syncyclonema n. g. Meek. (1864.)

- Check List Invert. Foss. N. Am., Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 31. Wash., 1864. F. B. Meek.

— *meekana* *Whiteaves*. (1882.)

- Proc. and Trans. Roy. Soc. Can., vol. 1, sec. 4, p. 86. Montreal, 1883. J. F. Whiteaves.
 Formation: Cretaceous.

- Location: Jackass mountain, also between Fountain and Lilloet, and near the thirty-sixth mile post on the wagon road to Yale. All localities on the Lower Fraser river, Canada.

— *meekiana* n. s. *Whiteaves*. (1876.)

- Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 82, 83, fig. 9, p. 82. Montreal, 1876. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Queen Charlotte islands.

— *rigida* (H. & M.) Meek. (1864.)

- Check List Invert. Foss. N. Am., Cret. and Jur., Smithsonian. Misc. Coll., vol. 7, No. 177, p. 31. Wash., 1864. F. B. Meek.
 Formation: Cretaceous.
 Location: Dakota.

— *rigida* (H. & M.) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 27, 28, pl. 16, figs. 5, a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Sage creek, Fox hills, and Moreau river.

— *rigida* (H. & M.) *Whitfield*. (1880.)

- Rep. Geol. Black Hills of Dak., pp. 383, 384, pl. 7, fig. 1. Wash., 1880. R. P. Whitfield.
 Formation: Cretaceous.
 Location: At the forks of the Cheyenne river, Black hills.

— *simplicia* n. s. *Conrad*. (1869.)

- Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 99, pl. 9, fig. 20. Phila., 1870. T. A. Conrad.
 Formation: Cretaceous.
 Location: Haddonfield, N. J.

Tancredia (Lycett) M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 95, 96. Wash., 1865.
Meek & Hayden.

— **? æquilateralis** n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 183.
Phila., 1861. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Nebr.

— **? æquilateralis** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 96, 97, pl. 3, fig. 8. Wash.,
1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills.

— **americana** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 142-144,
pl. 38, figs. 1a-h. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, on the Upper
Missouri, Cache la Poudre, in Colorado.

— **americana** (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 182. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valley of Cache la Poudre, and at
mouth of St. Vrain creek, Colo.

— **americana** (M. & H.) Whiteaves.
(1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 2, p. 39. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Berry creek, section 31, township 25,
range 12, west of the fourth principal meridian,
Canada.

— **americana** (M. & H.) Whiteaves.
(1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 2, p. 175. Montreal, 1889. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Sounding creek, township 30, range 8,
west of the fourth principal meridian, North-
west Territory.

— **bulbosa** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region
Prelim. Rep. Paleont., Black Hills, p. 22.
Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: East of Belle Fourche, Black hills, Dak.

— **bulbosa** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 370, 371, pl.
6, figs. 1-3. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near
Bear Lodge butte, Black hills.

— **? cœlionotus** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 182. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: The Cache la Poudre, ten miles west
of Greeley, Colo.

Tancredia—Continued.— **? cœlionotus** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 288, pl. 5, figs. 2a-d. Wash., 1879. C.
A. White.

Formation: Cretaceous.

Location: Ten miles west of Greeley, Colo.

— **corbuliformis** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region;
Prelim. Rep. Paleont., Black Hills, pp. 21, 22.
Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: East of Belle Fourche, Black hills, Dak.

— **corbuliformis** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 370, pl. 6,
figs. 5-8. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near
Bear Lodge butte, Black hills.

— **extensa** n. s. White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 150, pl. 38, fig. 4a. Wash., 1883.
C. A. White.

Formation: Jurassic.

Location: North side of Bull lake fork, South-
eastern Idaho.

— **? inornata** (M. & H.) Whitfield.
(1880.)

Rep. Geol. Black Hills of Dak., pp. 368, 369, pl.
6, figs. 9-13. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near
Bear Lodge butte, Black hills.

— **postica** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region;
Prelim. Rep. Paleont., Black Hills, pp. 22, 23.
Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: East of Belle Fourche, Black hills of
Dakota.

— **postica** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 371, 372, pl.
6, fig. 14. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, Black
hills.

— **warrenana** n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 183.
Phila., 1861. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Nebr.

— **warrenana** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, p. 96, pl. 3, fig. 7. Wash.,
1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills.

— **warrenana** (M. & H.) Whitfield.
(1880.)

Rep. Geol. Black Hills of Dak., p. 372, pl. 6, fig.
4. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Red water valley, southeast of Warren
peaks, Black hills.

Tapes [Megerle] Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 601. St. Louis, 1856-1860. B. F. Shumard.

— **conradiana n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 169, pl. 32, fig. 282. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon, Cal.

— **hilgardi n. s. Shumard. (1859.)**

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 601. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Bluffs of Red river, Lamar, and Fannin counties, Tex.

— **hilgardi (Shum.) Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, pp. 265, 266, pl. 36, fig. 13. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— **hilgardi (Shumard) White. (1883.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 22, pl. 16, figs. 3a-c. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Bluffs of Red river, Lamar, and Fannin counties, Tex.

— **montanensis n. s. Whitfield. (1876.)**

Rep. Rec. Carroll, Mont., to Yellowstone National Park, pp. 143, 144, pl. 2, figs. 1, 2. Wash., 1876. R. P. Whitfield.

Formation: Cretaceous.

Location: Near the mouth of the Judith river, Mont.

— **quadrata n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 169, pl. 30, fig. 249. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Fort Tejon and Martinez, Cal.

— **wyomingensis n. s. Meek. (1871.)**

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 310, 311. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Deer creek, on North Platte, in Wyoming.

Taphius (subgen. H. & A. Ad.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 536. Wash., 1876. F. B. Meek.

Tellimera n. g. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 73. Phila., 1871. T. A. Conrad.

— **eborea Conrad. (1870.)**

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 73. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

— **eborea (Con.) Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, pp. 164, 165, pl. 23, figs. 12-13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near Haddonfield, N. J.

Tellina [Linn.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 82. Phila., 1834. S. G. Morton.

— (Linn. typical) **Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

— **æqualis n. s. Gabb. (1869.)**

Geol. Sur. Cal. Paleont., vol. 2, pp. 182, 183, pl. 29, fig. 73. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **ashburnerii n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 159, pl. 23, fig. 139. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, north of Oroville, Butte county, Cal.

— **californica n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, p. 161, pl. 30, fig. 245. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: East of Mount Diablo, near Fort Tejon, Cal.

— **? cheyennensis n. s. M. & H. (1856.)**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 82. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Forks of Cheyenne river, Nebr.

— **decurtata n. s. Gabb. (1864.)**

Geol. Sur. Cal. Paleont., vol. 1, pp. 158, 159, pl. 23, fig. 137. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Pence's ranch, twelve miles north of Oroville, Butte county, Cal.

— **densata n. s. Conrad. (1853.)**

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 14. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Burlington county, N. J.

— **equilateralis n. s. M. & H. (1856.)**

Proc. Acad. Nat. Sci., Phila., for 1856, p. 82. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of the Judith river, Nebr.

— **equilateralis (M. & H.) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 183. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Mouth of the Saint Vrain creek, Colo.

— **eufaulensis n. s. Conrad. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 277. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **? formosa n. s. M. & H. (1860.)**

Proc. Acad. Nat. Sci., Phila., for 1860, p. 179. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Twenty miles below mouth of Cannon Ball river, Nebr.

Tellina—Continued.

- *gracilis* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 82.
Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of the Judith river, Nebr.
- *hoffmanniana* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 156, 157, pl. 22, figs. 133, 133a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: West of Martinez, Pence's ranch, Butte county, Cal.
- *hoffmanniana* Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 182, pl. 30, fig. 72. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Pence's ranch, Griswolds, Cal.
- *hornii* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 160, 161, pl. 30, fig. 244. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Fort Tejon, Clayton, Cal.
- ? *isonema* n. s. Meek. (1877.)
Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1, pp. 156, 157, pl. 15, fig. 6. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: Chalk creek, above Coalville, Utah; East canyon creek, Wasatch range.
- *isonema* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *longa* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 155, 156, pl. 22, fig. 131. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez; Marshs, fifteen miles east of Mount Diablo; Alizos creek, near Fort Tejon, Cal.
- *mathewsonii* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 158, pl. 23, fig. 136. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez; about a mile north of the village of Pacheco, southeast of Martinez, Cal.
- *meekiana* n. s. Whiteaves. (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 265. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Gabriola island.
- *meekiana* Whiteaves. (1874.)
Geol. Sur. Can. Rep. Prog. for 1873, 1874, p. 268, pl. fig. 6. Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Gabriola island.

Tellina—Continued.

- *modesta* n. s. Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 157, 158, pl. 15, figs. 4, 5. Wash., 1877. F. B. Meek.
Formation: Cretaceous.
Location: East canyon creek, Wasatch range.
- ? *modesta* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 236. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- ? *modesta* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.
- *monilifera* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 157, pl. 22, figs. 134, 134a. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Texas flat, Placer county, Cal.
- *nitidula* n. s. M. & H. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 443. Phila., 1862. Meek & Hayden.
Formation: Cretaceous.
Location: Deer creek, a tributary of the North branch of Platte river, Nebr.
- *occidentalis* n. s. Morton. (1841.)
Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser., 1839-1842, p. 210, pl. 11, fig. 3. Phila., 1839-1842. S. G. Morton.
Formation: Cretaceous.
Location: Great bend of the Missouri river (Lat. 43° 40' N.).
- *occidentalis* (Mort.) Marcou. (1858.)
Geol. N. Am., p. 42. Zurich, 1858. Jules Marcou.
Formation: Cretaceous.
Location: Between Gold mount and the villages of Galisteo and Algodones, in New Mexico.
- *parilis* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 160, pl. 30, fig. 243. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Martinez, Cal.
- *prouti* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 83. Phila., 1857. Meek and Hayden.
Formation: Cretaceous.
Location: Fort Benton.
- ? *quadrata* n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 159, pl. 23, fig. 138. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Cal.
- *reichii* (Röm.) Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halb. Mang. aleutischen Inseln, p. 123. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Kadiak island, Alaska.

Tellina—Continued.

- **remondii** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 156, pl. 22, fig. 132. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Cochran's, six miles east of Mount Diablo, near Fort Tejon, Cal.
- **remondii** Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 182, pl. 29, fig. 71. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Tejon, Cal.
- **ripleyana** n. s. Conrad. (1858.)
 Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 327. Phila., 1855-1858. T. A. Conrad.
 Formation: Cretaceous.
 Location: Owl creek, three miles north of the town of Ripley, Miss.
- **scitula** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 82. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Moreau river, Nebr.
- **scitula** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 183. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Mouth of the Saint Vrain creek and in the valley of the Coche la Poudre, Colo.
- **scitula** (M. & H.) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 179. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Bear creek, near Morrison, Colo.
- **skidegatensis** n. s. Whiteaves. (1884.)
 Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 225, 226, pl. 30, figs. 2, 2a, b. Montreal, 1864. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Bear Skin bay, Skidegate inlet.
- **subelliptica** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 83. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Cherry creek, Nebr.
- **subscitula** n. s. Meek. (1871.)
 Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 310. Wash., 1871. F. B. Meek.
 Formation: Cretaceous.
 Location: Twelve miles southwest of Salina, Saline county, Kans.
- **subtortuosa** n. s. M. & H. (1856.)
 Proc. Acad. Nat. Sci., Phila., for 1856, p. 272. Phila., 1857. Meek & Hayden.
 Formation: Cretaceous.
 Location: Mouth of Judith river, Nebr.
- **undulifera** n. s. Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 183, pl. 30, fig. 74. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: West of Martinez, Cal.

Tellina—Continued.

- (**Arcopagia**) ? **cheyennensis** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, p. 607, pl. 17, fig. 16. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Forks of Cheyenne river, Dak.
- (**Arcopagia**) **utahensis** (Meek) (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 236. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Coalville, Utah.
- (**Arcopagia** ?) **utahensis** (Meek) White. (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 248. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Bear river valley, Wyo.
- (**Cene** ?) **subscitula** Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 195, 196, pl. 2, figs. 11, a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Twelve miles southwest of Salina, Kan.
- (**Cene** ?) sp. undet., Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 143-144, pl. 17, fig. 10. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Vesuvius bay, Salt spring, or Admiralty island.
- (**Palæomoera** ?) **quadrata** (Gabb) Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 144. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Northwest side of Hornby island.
- (**Peronæa** ?) **aquilateralis** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 196, 197, pl. 39, figs. 5a-c. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Mouth of Judith river.
- (**Peronæa**) **occidentalis** (Meek sp.) Whiteaves. (1879.)
 Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 144, 145, pl. 17, figs. 11, 11a. Montreal, 1879. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: Gabriola island, two miles and a half up the Nanaimo river, Vancouver island.
- (**Peronæa** ?) **scitula** (M. & H.) Meek. (1876.)
 Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 197, 198, pl. 30, figs. 1a, b. Wash., 1876. F. B. Meek.
 Formation: Cretaceous.
 Location: Long lake, and on the Missouri above Fort Pierre; also on Moreau river and the South Branch of Cheyenne river.

Tellina—Continued.— (**Peronæoderma** ?) **mathewsoni** (Gabb) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 143. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo river, Vancouver island, two miles and a half up.

— (? **Sanguinolaria**) **whitneyi** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 160, pl. 30, fig. 242. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Jacksonville, Oregon.

— (**Tellinella**) **georgiana** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 307. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— (**Tellinimera** (**aborea** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 238, pl. 46, fig. 14. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama.

— (**Tellinimera**) **limatula** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 278, pl. 46, fig. 10. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: [Eufaula? Alabama.]

— **sp. undet.** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: Near Arneytown, N. J.

— **sp. undet.** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 82. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Tellinella (subgen. Gray) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

Tellinides (subgen. Sam.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 193. Wash., 1876. F. B. Meek.

Tellinimera n. subgen. Conrad. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d ser., 1858-1860, p. 278. Phila., 1858-1860. T. A. Conrad.

Temnochilus (subgen. McCoy) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 490. Wash., 1876. F. B. Meek.

Tenea n. g. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, pp. 72, 73. Phila., 1871. T. A. Conrad.

Tenea—Continued.— **paralis** n. s. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 73, pl. 3, fig. 12. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **paralis** Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 8, pl. 2, fig. 25. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

— **punguis** (Con. sp.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 307. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

— **punguis** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 163, 164, pl. 22, figs. 1-3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, Holmdel, Upper Freehold, near Burlington and Freehold, N. J.

Terebra (Lam.) N. & G. (1840.)

Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, p. 217. Bruxelles, 1840. Nyst & Galeotti.

— **californica** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 162, pl. 27, fig. 41. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **minuta** n. s. N. & G. (1840.)

Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2, p. 217, fig. 7. Bruxelles, 1840. Nyst & Galeotti.

Formation: Jurassic.

Location: Tehuacan, Mexico.

Terebratella (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

— **obesa** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 205, 206, pl. 26, figs. 194, 194, a, b. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Texas flat, Placer county, Cal.

— **plicata** (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **plicata** (Say) Cook. (1868.)

Ann. Rep. Geol. Sur. N. J., for 1868, p. 375, fig. p. 375. Newark, 1868. G. H. Cook.

Formation: Cretaceous.

Location: New Jersey.

— **plicata** (Say) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 12-14, pl. 1, figs. 5-9. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Cream ridge and Middletown, N. J.

Terebratella—Continued.— **vanuxemiana** (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19,
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **vanuxemi** (Lyell & Forbes) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 14, 15, pl. 1,
figs. 1-4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: [Cream ridge, Middletown, and other
localities in New Jersey.]

Terebratula (Llhwoyd) Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 43. New
Haven, 1820. Thomas Say.

— **atlantica** n. s. Morton. (1842.)

Jour. Acad. Nat. Sci., Phila., vol. 8, 1st ser.,
1839-1842, p. 214. Phila., 1839-1842. S. G.
Morton.

Formation: Cretaceous.

Location: Woodward's farm, N. J.

— **augusta** n. s. H. & W. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
p. 285, pl. 7, figs. 7-10. Wash., 1877. Hall &
Whitfield.

Formation: Jurassic.

Location: Shoshone springs, Augusta mountains,
Nev.

— **augusta** (H. & W.) White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Ter., vol. 5, No. 1,
pp. 108, 109. Wash., 1880. C. A. White.

Formation: Jura-Trias [Triassic].

Location: About sixty-five miles north of the
boundary line between Idaho and Utah, about
eighteen miles west of the boundary line be-
tween Idaho and Wyoming, and about five
miles south of John Gray's lake. Locality No. 1.

— **augusta** (H. & W. ?) White. (1883.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Ter., Part 1, p. 109. Wash., 1883. C. A. White.

Formation: Triassic.

Location: Loc. No. 1. Within the limits of
Idaho, about sixty-five miles north of the
boundary line between that Territory and Utah,
about eighteen miles west of the boundary line
between Idaho and Wyoming, and about five
miles of Gray's lake.

— **choctawensis** n. s. Shumard. (1853.)

Expl. Red River, La., by R. B. Marcy, pp. 207,
208, pl. 2, figs. a, b. Wash., 1853. B. F. Shu-
mard.

Formation: Cretaceous.

Location: Near Fort Washita, Ind. Terr.

— **choctawensis** (Shum.) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. —, p.
137. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Leon Springs.

Terebratula—Continued.— **choctawensis** (Shum.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19.
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

— **floridana** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 72, pl. 16,
fig. 7. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie bluff, Ala.

— **fragilis** n. s. Morton. (1828.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, pp. 75, 76, pl. 3, figs. 3, 4. Phila., 1827-
1831. S. G. Morton.

Formation: Cretaceous.

Location: New Egypt, N. J.

— **fragilis** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 283. New
Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: New Egypt, N. J.

— **fragilis** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 17.
New Haven, 1830. S. G. Morton.

— **fragilis** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 70, 71, pl.
3, fig. 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Egypt, N. J.

— **guadalupæ** Roemer. (1852.)

Kreide von Tex., p. 82, Taf. 6, figs. 3a-d. Bonn,
1852. F. Roemer.

Formation: Cretaceous.

Location: Ford of the Guadalupe. New Braun-
fels, Tex.

— **guadalupæ** (Roem.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19.
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

— **harlani** n. s. Morton. (1828.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser.,
1827-1831, pp. 73, 74, pl. 3, figs. 1, 2. Phila.,
1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **harlani** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 16.
New Haven, 1830. S. G. Morton.

— **harlani** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 283. New
Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: New Egypt, N. J.

— **harlani** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 70, pl. 3, fig.
1, pl. 9, figs. 8, 9. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Egypt and other places in New Jersey.

Terebratula—Continued.

- **harlani** (Mort.) Marcon. (1853.)
 Geol. Map of the U. S. and British Provinces of N. A., p. 47, pl. 7, fig. 7. Boston, 1853. Jules Marcon.
 Formation: Cretaceous.
 Location: New Jersey.
- **harlani** (Mort.) Gabb. (1861.)
 Proc. Acad. Nat. Sci., Phila., for 1861, p. 18. Phila., 1862. W. M. Gabb.
 Formation: Cretaceous.
 Location: New Jersey.
- **harlani** (Mort.) Cook. (1868.)
 Ann. Rep. Geol. Sur. N. J., for 1868, p. 375, figs. p. 375. Newark, 1868. G. H. Cook.
 Formation: Cretaceous.
 Location: New Jersey.
- **harlani** (Mort.) Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, pp. 6-9, pl. 1, figs. 15-23. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: New Egypt, Timber creek, Mullica hill, Kirby's marl pits, two miles southwest of Harrisonville, N. J., Old Man creek, N. J.
- **harlani** var. **discoïdal** n. var. **Morton**. (1833.)
 Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 9, fig. 8. New Haven, 1833. S. G. Morton.
 Formation: Cretaceous.
 Location: Ralph's mills, Burlington, N. J.
- **harlani** var. **fragilis** (Mort.) Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, pp. 7, 8, pl. 1, figs. 15-18. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: [New Egypt, Timber creek, Mullica hill, Kirby's marl pits, two miles southwest of Harrisonville, N. J., Old Man creek, N. J.]
- **harlani** var. **perovalis** (Mort.) Whitfield. (1885.)
 Mon. U. S. Geol. Sur., vol. 9, p. 8, pl. 1, fig. 19. Wash., 1885. R. P. Whitfield.
 Formation: Cretaceous.
 Location: New Egypt, Timber creek, Mullica Hill, Kirby's marl pits, two miles southwest of Harrisonville, N. J.; Old Man's creek, N. J.
- **harlani** var. **rectilateral** n. var. **Morton**. (1833.)
 Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 9, fig. 9. New Haven, 1833. S. G. Morton.
 Formation: Cretaceous.
 Location: Ralph's mills, Burlington county, N. J.
- **harlani** (Morton.) Bronn. (1838.)
 Lethaea Geognostica, Zweiter Band, p. 661. Stuttgart, 1838. H. G. Bronn.
 Formation: Cretaceous.
 Location: New Egypt, N. J.
- **harlani** (Mort.) Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 221-223. Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: New Jersey.

Terebratula—Continued.

- **helena** n. s. Whitfield. (1875.)
 Rep. Rec. Black Hills of Dak., pp. 103, 104, pl. —, figs. 7-9. Wash., 1875. R. P. Whitfield.
 Formation: Cretaceous.
 Location: On the northeast side of the Black hills, a few miles north of the Belle Fourche.
- **humboldtensis** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 34, pl. 6, figs. 35, 35a, b. Phila., 1864. W. M. Gabb.
 Formation: Triassic.
 Location: Star canyon, Humboldt county, Nev.
- **humboldtensis** (Gabb) H. & W. (1877.)
 Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2, pp. 282, 283, pl. 6, figs. 22-24. Wash., 1877. Hall & Whitfield.
 Formation: Triassic.
 Location: Near Dun Glen pass, Pah-Ute range, Nev.
- **humboldtensis** (Gabb) Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 129. Montreal, 1889. J. F. Whiteaves.
 Formation: Triassic.
 Location: McDonald river, on Nicola lake, Canada.
- **lachryma** n. s. Morton. (1833.)
 Am. Jour. Sci., 1st ser., vol. 24, p. 130, pl. 10, fig. 11. New Haven, 1833. S. G. Morton.
 Formation: Cretaceous [Tertiary].
 Location: South Carolina.
- **lachryma** Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 72, pl. 10, fig. 11; pl. 16, fig. 6. Phila., 1834. S. G. Morton.
 Formation: Cretaceous [Tertiary].
 Location: South Carolina; below Claiborne, Ala.
- **leonensis** n. s. Conrad. (1857.)
 Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 164, pl. 21, fig. 2. Wash., 1857. T. A. Conrad.
 Formation: Cretaceous.
 Location: Leon Springs [Texas].
- **liardensis** n. s. Whiteaves. (1889.)
 Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 130, 131, pl. 17, figs. 2, 2a-c. Montreal, 1889. J. F. Whiteaves.
 Formation: Triassic.
 Location: Liard river, about twenty-five miles below Devil's portage; also about thirty miles below the same portage, Canada.
- **obesa** (Gabb) Whiteaves. (1884.)
 Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 245, 246. Montreal, 1884. J. F. Whiteaves.
 Formation: Cretaceous.
 Location: South side of Alliford bay.
- **perovalis** ? (Sow.) Morton. (1828.)
 Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, pp. 77-79, pl. 3, figs. 7, 8. Phila., 1827-1831. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey.

Terebratula—Continued.— **plicata** n. s. Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, pp. 43, 44. New Haven, 1820. Thomas Say.

Formation: [Cretaceous.]

Location: New Jersey.

— **robusta** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 163, 164, pl. 22, figs. 1, 1a, b, and 2. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest territory.

— **sayi** n. s. Morton. (1828.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1828-1831, pp. 76, 77, pl. 3, figs. 5, 6. Phila., 1828-1831. S. G. Morton.

Formation: Cretaceous.

Location: Woodward's farm, near Walnford, Burlington county, N. J.

— **sayi** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 283. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **sayi** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, figs. 14, 15. New Haven, 1830. S. G. Morton.

— **sayi** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 71, pl. 3, figs. 3, 4. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Woodward's farm, near Walnford, Burlington county, N. J.

— **semisimplex** n. s. White. (1880.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 5, No. 1, p. 108. Wash., 1880. C. A. White.

Formation: Jura-Trias. [Triassic].

Location: About sixty-five miles north of the boundary line between Idaho and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles south of John Gray's lake, locality No. 1.

— **semisimplex** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 108, 109, pl. 31, figs. 3a-c. Wash., 1883. C. A. White.

Formation: Triassic.

Location: Location No. 1. Within the limits of Idaho, about sixty-five miles north of the boundary line between that Territory and Utah, about eighteen miles west of the boundary line between Idaho and Wyoming, and about five miles west of Gray's lake.

— **vanuxemiana** n. s. Forbes. (1844.)

Quart. Jour. Geol. Soc., London., vol. 1, p. 62, figs. —, p. 62. London, 1845. Edward Forbes.

Formation: Cretaceous.

Location: New Jersey.

Terebratula—Continued.— **wacoensis** n. s. Roemer. (1852.)

Kreide. von Texas, pp. 81, 82, Taf. 6, figs. 2a-a. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Waco camp on the Guadalupe above New Braunfels, Tex.

— **wacoensis** (Roemer) Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 147, pl. 3, fig. 1. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Aroyo Pedras Pintas.

— **wacoensis** (Roemer) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 18. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Texas.

— **wacoensis** (Roemer) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 177. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Banks of the Trent river, Vancouver island.

— [Llhwyd] Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 45. New Haven, 1820. Thomas Say.

Formation: Cretaceous.

Location: New Jersey.

— **sp. undet.** Roemer. (1849.)

Texas, p. 408. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Waco camp on the Guadalupe above New Braunfels, Tex.

— **sp. undet.** Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 41, pl. 8, figs. 2, 2a, b. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

— **sp. undet.** Whiteaves. (1878.)

Geol. Sur. Can., Rep. Prog. for 1876-1877, pp. 150, 151. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake and Iltasyouco river, British Columbia.

— (?) **sp. undet.** Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 84. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— (?) **sp. undet.** Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, p. 84. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **sp. undet.** Whiteaves. (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, pp. 400, 401. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Sigutlat lake and Iltasyouco river.

Tellina ooides n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 157, 158, pl. 22, figs. 135, 135a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: West of Martinez, Pence's Ranch, Butte county, Cal.

Terebratulina (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

— **atlantica** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 9-11, pl. 1, figs. 10-13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Farmingdale, Shark river, Woodward's farm, N. J.

— **filosa** n. s. Conrad. (1866.)

Am. Jour. Conch., vol. 2, p. 77, pl. 9, figs. 4, 5. Phila., 1866. T. A. Conrad.

Formation: Cretaceous.

Location: Alabama.

— **floridana** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 11, 12. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey?

— **floridi[a]na** (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Alabama.

— **halliana** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— **lachryma** (d'Orb.) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 19. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

Terebratella plicata (Say.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 224, 225. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Marlboro and Nut swamp, N. J.

Terebrispira subgen. (Conrad) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 356. Wash., 1876. F. B. Meek.

Teredo (Linn.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

— (Linn. typical) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 261. Wash., 1876. F. B. Meek.

— **antennautæ** ? (Sow.) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 123. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county, N. J.

Teredo—Continued.— **antennautæ** ? (Sow.) Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

Formation: Cretaceous.

Location: Chesapeake and Delaware canal, and New Jersey.

Teredo calamus n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 170. Phila., 1856. M. Tuomey.

Form: Cretaceous.

Location: Columbus, Miss.

— **contorta** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 323, 324. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

— **globosa** n. s. M. & H. (1858.)

Proc. Acad. Nat. Sci., Phila., for 1858, p. 53. Phila., 1859. Meek & Hayden.

Formation: Cretaceous.

Location: Square butte, near Fort Clark.

— **globosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 264, 265, pl. 30, fig. 13, figs. 31, 32, p. 264. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Clark, on the Missouri, [N. Dak.]

— **irregularis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 393, pl. 68, fig. 19. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

— **irregularis** (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 191, 192, pl. 25, figs. 18, 19. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey.

— **pugetensis** n. s. White. (1889.)

Bull. U. S. Geol. Sur. No. 51, p. 62, pl. 7. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Carbonado, Wash.

— **selliformis** n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, pp. 178, 179. Phila., 1861. Meek & Hayden.

Formation: Cretaceous.

Location: Fort Clark, on the Missouri, Nebr. [N. Dakota.]

— **selliformis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 262, 263, pl. 17, figs. 19a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Fort Clark, on the Missouri, [N. Dak.]

— **socialis** Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, p. 157. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

Teredo—Continued.

- **suciensis** n. s. Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 135-137, pl. 17, figs. 1, 1a. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Southwest of Denman island, Sucia islands.
- **suciensis** Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 218, 219, pl. 29, fig. 1. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: North shore of Cumshewa inlet.
- **suciensis** (Whiteaves?) White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 44. Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia island.
- **sp. undet.** Credner. (1870.)
Zeitsch. Deutsch. Geol. Ges. Band 22, p. 236. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.
- **tibialis** n. s. Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 23, p. 292, (pl. 9, fig. 2, [vol. 24]). New Haven, 1833. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **tibialis** Morton. (1833.)
Am. Jour. Sci., 1st ser., vol. 24, p. 9, fig. 2. New Haven, 1833. S. G. Morton.
- **tibialis** Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., pp. 68, 69, pl. 9, fig. 2. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey.
- **tibialis** (Morton) Gabb. (1861.)
Proc. Acad. Nat. Sci., Phila., for 1861, p. 366. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
- **tibialis** (Morton) Cook. (1868.)
Ann. Rep. Geol. Sur. N. J., for 1868, p. 376, fig. —. Newark, 1868. G. H. Cook.
Formation: Cretaceous.
Location: New Jersey.
- **tibialis** (Mort.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 201-203, pl. 26, figs. 19-22. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Timber creek and near New Egypt, N. J.
- **sp. undet.** Roemer. (1849.)
Texas, p. 408. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: [Ford near New Braunfels] Texas.
- **sp. undet.** Roemer. (1852.)
Kreide. von Texas, p. 44. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ford of the Guadalupe, New Braunfels, Tex.

Teredo—Continued.

- ? **White.** (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 184. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Valley of Little Thompson creek, Colo.
- **sp. undet.** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 206. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Sage creek, Col.
- Tessarolax** n. g. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1 p. 126. Phila., 1864. W. M. Gabb.
- **distorta** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 126, 127, pl. 20, figs. 82, 82a, b. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.
- **distorta** Gabb. (1868.)
Am. Jour. Conch., vol. 4, p. 146, pl. 14, figs. 18, 19. Phila., 1868. W. M. Gabb.
Formation: Cretaceous.
- **distorta** (Gabb) Whiteaves. (1879.)
Geol. Sur. Can. Mes. Foss., vol. 1. pt. 2, p. 123. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Banks of the Trent river, below the falls, Vancouver island.
- **hitzii** n. s. White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 29, 30, pl. 15, fig. 2a. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Fort Shaw, near Muscle Shell river, Mont.
- Textilaria americana** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 4a. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **americana** ? Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 7. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **euryconus** Ehrenberg.
Mikrogeologie, Taf. 32, fig. 9. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **globulosa** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 8. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Missouri region.
- **globulosa** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 12. Leipzig, 1854. C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.

Textilaria—Continued.— **gomphoconus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 10. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **inflata** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 13. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **missouriensis** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 5. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **poroconus** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 6. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

— **striata** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, figs. 11 and 14. Leipzig, 1854. C. G. Ehrenberg.

Formation: Cretaceous.

Location: Mississippi region.

— **striata** Ehrenberg. (1854.)

Mikrogeologie, Taf. 32, fig. 4b. Leipzig, 1854.
C. G. Ehrenberg.

Formation: Cretaceous.

Location: Missouri region.

Textularia agglutinans var. **pygmæa** (d'Orb.) Dawson. (1874.)

Canadian Naturalist, vol. 7, n. ser., pp. 253, 254, fig. 1, b. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: About twenty miles north of the forty-ninth parallel, on the escarpment called Pembina mountain, Manitoba.

— **agglutinans** var. **pygmæa** (d'Orb.) Dawson. (1875.)

British N. Am. Bound. Com., Rep. Geol. and Res. Forty-ninth Parallel, p. 79, pl. 17, fig. 2a. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: Boyne river, Manitoba, Canada.

— **gibbosa** var. **globulosa** (Ehr.) Dawson. (1875.)

British N. Am. Bound. Com., Rep. Geol. and Res. Forty-ninth Parallel, p. 79, pl. 17, fig. 2a. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: Boyne river, Manitoba, Canada.

— **globulosa** (Ehrenberg) Dawson. (1874.)

Canadian Naturalist, vol. 7, n. ser., p. 253, fig. 1, a. Montreal, 1875. G. M. Dawson.

Formation: Cretaceous.

Location: About twenty miles north of the forty-ninth parallel, on the escarpment called Pembina mountain, Manitoba.

Thaumastus (Albers) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 553. Wash., 1876. F. B. Meek.

— **limnæiformis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 553, 554, pl. 44, figs. 8a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Opposite the mouth of Yellowstone river, northwestern Dakota.

— **limnæiformis** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 88. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Near mouth of Yellowstone river, Mont.

— **limnæiformis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 454, pl. 25, fig. 24. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **limnæiformis** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 20, pl. 3, fig. 3. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rosebud river, township 27, range 25, west of fourth principal meridian; Three Hills creek, township 30, range 23, west of fourth meridian, Canada.

— **limnæiformis** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 27, pl. 3, figs. 3a, b. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Wood End depot, Souris river, and Pyramid creek, Canada.

— **limnæiformis** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 72. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, six miles above the mouth of Bow river, Canada.

Theliostyla subgen. (Mörch) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 170. Phila., 1869. W. M. Gabb.

Thetiopsis (Meek) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 152. Montreal, 1879. J. F. Whiteaves.

— **circularis** (M. & H. sp.) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 153. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Hornby island, northwest side; Nanaimo river, Vancouver island, ten miles up; Suci islands.

Thetis (Sby.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 186. Phila., 1869. W. M. Gabb.

— *affinis* nom. prov. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 226, 227, pl. 30, figs. 4, 4a, b. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet.

— ? *circularis* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 190, 191, pl. 17, figs. 8a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Near Black hills, on Cheyenne river; also near the mouth of Milk river, on the Missouri.

— ? *circularis* (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 206. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Sage creek, Colo.

— *circularis* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 417, pl. 11, figs. 22-24. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Near the forks of the Cheyenne river, and near the mouth of Rapid creek, Black hills, Dak.

— ? *elongata* n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 186, pl. 30, figs. 80, 80a. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Vicinity of Cottonwood creek, Cal.

Thracia (Leach) M. & H. (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, pp. 101, 102. Wash., 1865. Meek & Hayden.

— ? *arcuata* n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 182. Phila., 1861. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Nebr. [S. Dak.]

— ? *arcuata* M. & H. (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, p. 102, pl. 4, fig. 8. Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills.

— *gracilis* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 224, 225, pl. 39, figs. 6a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Idaho Ter., on the Missouri.

— ? *occidentalis* n. s. Meek. (1858.)

Trans. Albany Inst., vol. 4, pp. 43, 44. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

Thracia—Continued.**— ? *occidentalis* Meek. (1876.)**

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, p. 363, pl. 2, figs. 3, 3a. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— *myæformis* n. s. White. (1879.)

Proc. U. S. Nat. Mus., vol. 2, pt. 2, pp. 297, 298, pl. 6, figs. 1, 2. Wash., 1880. Smithsonian. Misc. Coll., vol. 19. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Bell county, Tex.

— *myæformis* White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 23, pl. 17, figs. 2a, b. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Bell county, Tex.

— ? *prouti* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 225, 226, pl. 37, figs. 6a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Idaho Ter., on the Missouri.

— *semitplanata* n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 221, 222, pl. 29, figs. 5, 5a-c. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay; Bear Skin bay, Skidegate inlet; South island.

— *subgracilis* n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, p. 36. Wash., 1877. R. P. Whitfield.

Formation: Cretaceous.

Location: Near French creek, on Cheyenne river, Dak.

— *subgracilis* Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 419, 420, pl. 11, figs. 29, 30. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: Near French creek, on the Cheyenne river, Black hills, Dak.

— ? *sublevis* n. s. M. & H. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 182. Phila., 1861. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills, Nebr. [S. Dak.]

— ? *sublævis* M. & H. (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, p. 102, pl. 4, figs. 4, 4a. Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills.

— ? *sublevis* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 375, pl. 5, fig. 34. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Redwater valley, Black hills.

Thracia—Continued.— **subtortuosa** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 223, 224, pl. 37, fig. 5. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, Idaho Ter., on the Missouri.

— **? subtruncata n. s.** Meek. (1858.)

Trans. Albany Inst., vol. 4, pp. 44. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **? subtruncata** Meek. (1876.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 363, 364, pl. 2, figs. 4, 4a. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— **subtruncata** (Meek) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 140. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island, Sucia islands.

— **(Corimya) grinnelli n. s.** Whitfield. (1876.)

Rep. Rec. Carroll, Mont., to Yellowstone National Park, pp. 144, 145, pl. 2, figs. 6, 7. Wash., 1876. R. P. Whitfield.

Formation: Cretaceous.

Location: Mouth of Judith river, Mont.

— **(Periploma) simplex** (d'Orb.) Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, p. 121. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kadiak island, Alaska.

— **sp. undet.** Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, p. 56. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **sp. undet.** Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, p. 1, p. 57. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **sp. undet.** Whiteaves. (1877.)

Geol. Sur. Can. Rep. Prog. for 1875, 1876, App. II, pp. 96, 97. Montreal, 1877. J. F. Whiteaves.

Formation: Jurassic or Cretaceous.

Location: Rock Island gates, below Hudson's hope, Peace river.

Thylacus n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290. Phila., 1858-1860. T. A. Conrad.

— **cretaceus n. s.** Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 290, pl. 46, fig. 22. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Ala. [Miss.].

Tiara humerosa Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 431.

Phila., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Elk station, Central Pacific railroad, beyond Salt lake.

Torcula ? [Gray.] Conrad. (1869.)

Am. Jour. Conch. vol. 5, Phila., 1869, 1870, p. 45, pl. 1, fig. 15. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: New Jersey.

Torni[a]tella [Lam.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 48. Phila., 1834. S. G. Morton.

Tornatella (Lam.) Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 194. Boston, 1862. B. F. Shumard.

— **? bullata n. s.** Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 292, pl. 5, fig. 3. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Torni[a]tella ? bullata Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 48, pl. 5, fig. 3. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Tornatella texana n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 194. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Red river, Lamar county, Tex.

Torni[a]tella sp. undet. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 48. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Tornatella sp. undet. Forbes. (1844.)

Quart. Jour. Geol. Soc. London, vol. 1, p. 63, fig. c, p. 63. London, 1845. Edward Forbes.

Formation: Cretaceous.

Location: New Jersey.

Toxaster elegans (Shum.) Hall. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 146, pl. 21, figs. 1a-e. Wash., 1857. James Hall.

Formation: Cretaceous.

Location: Eagle springs, Tex.

— **texanus n. s.** Roemer. (1849.)

Texas, p. 393. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **texanus** Roemer. (1852.)

Kreide von Texas, pp. 85, 86, Taf. 10, figs. 3a-c. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— **texanus** (Roem.) Hall. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 145, pl. 1, figs. 2a-c. Wash., 1857. James Hall.

Formation: Cretaceous.

Location: Leon springs, Tex.

Trachycardium subgen. (Mörch.) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 282. Phila., 1858-1860. T. A. Conrad.

Trachyceras (Laube) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 116. Wash., 1877. F. B. Meek.

— **canadense** n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 142-144, pl. 18, figs. 4, 4a. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about twenty-five miles below Devil's portage, Canada.

— **judicarium** (Mojsisovics) Meek. (1870.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, p. 118, pl. 11, figs. 1, 1a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Cottonwood canyon, West Humboldt range, Nev.

— **whitneyi** (Gabb) Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1, pp. 116-118, pl. 11, figs. 3, 3a. Wash., 1877. F. B. Meek.

Formation: Triassic.

Location: Cottonwood canyon, West Humboldt range, Nev.

Trachytiron n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 37. Wash., 1864. F. B. Meek.

— (subgen. Meek) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2. Phila., 1869. W. M. Gabb.

— **vinculum** (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 37. Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Dakota.

— **vinculum** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 304-306, pl. 19, figs. 7a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Great bend of the Missouri river, Dak.

Trapezium (Humph.) Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont., Black Hills, p. 18. Wash., 1877. R. P. Whitfield.

— **bellefourchensis** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, pp. 18, 19. Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: East of Belle Fourche, Black hills, Dak.

— **bellefourchensis** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 364, 365, pl. 5, figs. 1-4. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East of the Belle Fourche river, near Bear Lodge butte, Black hills.

Trapezium—Continued.— **miconema** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 493. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Bear River city, on Sulphur creek, Wyo.

— ? **miconema** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 293, pl. 10, fig. 5. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River city, on Sulphur creek, Wyo.

— **subequalis** n. s. Whitfield. (1877.)

U. S. Geogr. and Geol. Sur. Rocky Mt. Region; Prelim. Rep. Paleont. Black Hills, pp. 19, 20. Wash., 1877. R. P. Whitfield.

Formation: Jurassic.

Location: Red Canyon creek, Black hills, Dak.

— **subequalis** Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 365, 366, pl. 5, figs. 5-8. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: Red Canyon creek, Black hills, Dak.

— **truncatum** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 292, 293, pl. 10, figs. 6a-b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Vicinity of Salt lake, Utah.

Trematodiscus (subgen. M. & W.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 491. Wash., 1876. F. B. Meek.

Trematopygus crucifer (Mort.) d'Orb. (1855.)

Paleont. Francaise, Echinoides Irreguliers, Terr. Crét. t. Sixième, pp. 387, 388, pl. 953, figs. 10, 11; pl. 963, figs. 1-5. Paris, 1853-1860. A. d'Orbigny.

Formation: Cretaceous.

Location: New Jersey.

— **crucifer** (Morton) Clark. (1891.)

Johns Hopkins Univ. Cir., vol. 10, No. 87, p. 76. Baltimore, 1891. Wm. B. Clark.

Formation: Cretaceous—Middle Marl Bed.

Location: New Jersey.

Trichotropis (Sow.) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333. Phila., 1855-1858. T. A. Conrad.

— **cancellaria** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333, pl. 35, fig. 8. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

Trigonarca Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 43. Phila., 1870. T. A. Conrad.

Trigonarca—Continued.

- (Conrad) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 90. Wash., 1876. F. B. Meek.
- *cuneata* n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 316, 317. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Clay county, Ga.
- *cuneiformis* n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 98, pl. 9, fig. 1. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- *cuneiformis* (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 88, 89, pl. 12, figs. 17-18. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Haddonfield, N. J.
- *passa* n. s. Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 43, pl. 1, fig. 17. Phila., 1870. T. A. Conrad.
Formation: Cretaceous.
Location: Crosswicks, N. J.
- *transversa* (Gabb) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 89-91, pl. 12, figs. 13-16. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Burlington, Mullica Hill, and perhaps Arneytown, N. J.

Trigonellites (Parkinson) M. & H. (1865.)

- Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 118-121, figs. 1-4 text. Wash., 1865. Meek & Hayden.

Trigonia [Brug.] Morton. (1834.)

- Synop. Org. Rem. Cret. Gr. U. S., p. 65. Phila., 1834. S. G. Morton.

- *æquicostata* n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 196. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Orestimba canyon; Curry's, south of Mount Diablo, Cal.; Jacksonville, Oregon; Martinez; Cottonwood creek, Cal.
- *aliformis* (Park.) Roemer. (1849.)
Texas, p. 404. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg and ford, near Braunfels, Tex.
- *americana* (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 148, pl. 38, figs. 1a, b. Wash., 1880. C. A. White.
Formation: Jurassic.
Location: Near lower canyon of Yellowstone river, Mont.

Trigonia—Continued.

- *angulicostata* n. s. Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, pp. 312, 313. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Ga.
- *cerulia* n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 114, 115, pl. 14, fig. 7. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Deep cut on the Holmdel and Keyport turnpike, Monmouth county, N. J.
- *conradi* n. s. M. & H. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, pp. 183, 184. Phila., 1861. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills, Nebr. [S. Dak.]
- *conradi* M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, pp. 83, 84, pl. 3, fig. 11. Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of the Black hills.
- *consobrina* n. s. Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, pp. 182, 183, Taf. 14, fig. 7. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.
- *crenulata* (Lam.) Roemer. (1852.)
Kreide. von Texas, pp. 51, 52, Taf. 7, fig. 6. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- *crenulata* (Lam.) Shumard. (1853.)
Expl. Red River, La., by R. B. Marcy, p. 206, pl. 4, fig. 1. Wash., 1853. B. F. Shumard.
Formation: Cretaceous.
Location: Cross Timbers, Tex.
- *dawsoni* n. s. Whiteaves. (1878.)
Canadian Naturalist, vol. 8, n. ser., No. 7, p. 405. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river and Sigutlat lake.
- *dawsoni* Whiteaves. (1878.)
Geol. Sur. Can., Rep. Prog. for 1876-1877, pp. 154, 155. Montreal, 1878. J. F. Whiteaves.
Formation: Jurassic.
Location: Iltasyouco river and Sigutlat lake, British Columbia.
- *dawsoni* Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 231, 232, pl. 31, figs. 1, 1a. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: South side of Alliford bay.
- *dawsoni* Whiteaves. (1889.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 167, 168. Montreal, 1889. J. F. Whiteaves.
Formation: Cretaceous.
Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest territory.

Trigonia—Continued.**— *devexa* n. s. Eichwald. (1871.)**

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, p. 183, Taf. 14, figs. 5, 6. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— *diversicostata* n. s. Whiteaves. (1876.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 68-70, pl. 10, fig. 1. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— *diversicostata* Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 230. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: Bear Skin bay, Skidegate inlet.

— *doroschini* n. s. Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, pp. 180-182, Taf. 13, figs. 12-14; Taf. 14, figs. 1-4. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Egge, Tukusitnu bay, Alaska.

— *emoryi* n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 148, pl. 3, figs. 2a-c. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Between El Paso and Frontera.

— *eufalensis* n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 396, pl. 68, fig. 32. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— *eufalensis* (Gabb) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 113, 114, pl. 14, figs. 1-4. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: At the crossing of the West Jersey railroad at a creek between Red bank and Gloucester, N. J.; also in Monmouth county, N. J.

— *evansana* n. s. Meek. (1858.)

Trans. Albany Inst., vol. 4, pp. 42, 43. Albany, 1858-1864. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— *evansana* (Meek) Whiteaves. (1879.)

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 161. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest bay, Vancouver island.

— *evansana* (Meek) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 39. Wash., 1889. O. A. White.

Formation: Cretaceous.

Location: Sucia island.

Trigonia—Continued.**— *evansi* Meek. (1876.)**

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No. 4, pp. 359, 360, pl. 2, figs. 7, 7a, 7b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Nanaimo, Vancouver island.

— *evansii* (Meek) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 189, pl. 25, fig. 177. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Tehama county; Chico creek, Butte county; Curry's, south of Mount Diablo; Benicia, Martinez, Rancho de San Luis Gonzaga, Pacheco's pass, Cal.; Jacksonville and Siskiyou mountains, Oregon; Nanaimo, Vancouver island.

— *gibboniana* (Lea?) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 190, pl. 17, fig. 178; pl. 31, fig. 262. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.; Jacksonville, Oregon.

— *intermedia* (Fahrenkohl) Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, p. 262. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South side of Alliford bay.

— *leana* n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci. Phila. for 1876, p. 312. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: California.

— *limbata* (d'Orb.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges. Band 22, pp. 234, 235. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Woodbury, N. J.

— *maudensis* n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can. Mes. Foss., vol. 1, pt. 3, pp. 230, 231, pl. 31, fig. 2. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: North side of Maud island; South island, north side of Cumshewa inlet.

— *montanaensis* (Meek) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 147, 148, pl. 38, fig. 2a. Wash., 1880. C. A. White.

Formation: Jurassic.

Location: Near the lower canyon of the Yellowstone, Mont.

— *mooreana* Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 269. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

Trigonia—Continued.

- **mortoni** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 112, 113, pl. 14,
figs. 5, 6. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Freehold, Burlington, Monmouth,
Holmdel, N. J.
- **nana** n. s. Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. aleu-
tischen Inseln, p. 180, Taf. 14, fig. 8. St. Peters-
burg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Tukusitnu bay, Alaska.
- **pandicosta** n. s. Meek. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 48, 49, pl. 8,
fig. 7. Phila., 1864. F. B. Meek.
Formation: Jurassic.
Location: Genesee valley, Plumas county, Cal.
- **plicato-costata** n. s. N. & G. (1840.)
Bull. Roy. Acad. Sci., Bruxelles, Tome 7, pt. 2,
pp. 212, 213, fig. 1. Bruxelles, 1840. Nyst &
Galeotti.
Formation: Jurassic.
Location: Tehuacan, Mexico.
- **quadrangularis** n. s. H. & W. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 2,
pp. 293, 294, pl. 7, fig. 22. Wash., 1877. Hall
& Whitfield.
Formation: Jurassic.
Location: Near Como, Laramie plains, Wyo.
- **texana** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p.
148, pl. 3, figs. 3a-c. Wash., 1857. T. A. Con-
rad.
Formation: Cretaceous.
Location: Leon springs.
- **thoracica** n. s. Morton. (1834.)
Synop. Org. Rem. Cret. Gr. U. S., p. 65, pl. 15,
fig. 13. Phila., 1834. S. G. Morton.
Formation: Cretaceous.
Location: New Jersey and Alabama.
- **thoracica** (Mort.) Roemer. (1852.)
Kreide. von Texas, p. 52. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Ravine three miles from New Braunfels
on road to Seguin, Tex.
- **thoracica** (Mort.) Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, pp. 304, 305, pl. 47, fig. 10. Phila., 1858-
1860. W. M. Gabb.
Formation: Cretaceous.
Location: Tennessee.
- **thoracica** (Mort.) Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 282, pl. 47, fig. 10. Phila., 1858-1860.
T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula, Ala.
- **thoracica** (Mort.) Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 312.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
Location: Pataula creek, Ga.

Trigonia—Continued.

- **tryoniana** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 188, 189, pl.
pl. 25, fig. 176. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.
- **tryoniana** (Gabb) Whiteaves.
(1879.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, p. 161,
pl. 18, fig. 7. Montreal, 1879. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- ? [Brug.] Morton. (1830.)
Am. Jour. Sci., 1st ser., vol. 17, p. 285. New
Haven, 1830. S. G. Morton.
Formation: Cretaceous.
Location:
- **sp. A. Whiteaves.** (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 262.
Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- **sp. B. Whiteaves.** (1874.)
Geol. Sur. Can., Rep. Prog. for 1873, 1874, p. 262.
Montreal, 1874. J. F. Whiteaves.
Formation: Cretaceous.
Location: Northwest bay, Vancouver island.
- **sp. undet. White.** (1875.)
Rep. Geogr. and Geol. Expl. and Sur. west of
One-hundredth Meridian, vol. 4, pt. 1, p. 167.
Wash., 1875. C. A. White.
- **sp. undet. Whiteaves.** (1876.)
Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 70-
72, pl. 10, figs. 2, 2a. Montreal, 1876. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **sp. undet. Urquiza.** (1882.)
An. Min. Fomento Rep. Mex., Tomo 7, p. 224,
fig. 15. Mexico, 1882. M. Urquiza.
Formation: Cretaceous.
Location: Astala, Coalcoman district, state of
Michoacan, Mexico.
- **sp. undet. Hill.** (1889.)
Geol. Sur. Tex., Bull. No. 4, p. 11. Austin, 1889.
R. T. Hill.
Formation: Cretaceous.
Location: North of Webberville, Tex.
- Trigonoarca Conrad.** (1867.)
Am. Jour. Conch., vol. 3, p. 9. Phila., 1867.
T. A. Conrad.
- **maconensis** Conrad. (1867.)
Am. Jour. Conch., vol. 3, p. 9. Phila. 1867.
T. A. Conrad.
Formation: Cretaceous.
Location: Haddonfield, New Jersey.
- **perovalis** Conrad. (1872.)
Proc. Acad. Nat. Sci., Phila., for 1872, p. 55, pl. 2,
fig. 4. Phila., 1872. T. A. Conrad.
Formation: Cretaceous.

Trigonoarca—Continued.— **saffordii** (Gabb) Conrad. (1872.)

Proc. Acad. Nat. Sci., Phila., for 1872, p. 55, pl. 2, fig. 3. Phila., 1872. T. A. Conrad.

Formation: Cretaceous.

— **triquetra** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 2, pl. 1, fig. 7. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

— **tumida** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, pp. 235, 236, pl. 31, fig. 6. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud island.

— **tumida** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 167. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: Rocky mountains, three miles north of the east end of Devil's lake, Northwest Territory.

— **(Breviarca) congesta** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 3, pl. 1, fig. 2. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

— **(Breviarca) carolinensis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 3, pl. 1, fig. 4. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

— **(Breviarca) exigua** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 93, 94, pl. 15, figs. 2a-f. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Milk river, on the Missouri, and near the forks of Cheyenne river.

— **(Breviarca) perovalis** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 3, pl. 1, fig. 3. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

— **(Breviarca ?) salinaensis** n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 92, 93, pl. 2, figs. 1a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina Kans.

BULL. 102—19

Trigonoarca—Continued.— **(Breviarca ?) siouxensis** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 92, pl. 1, fig. 6. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Big Sioux river, on the Missouri.

— **(Breviarca) umbonata** n. s. Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1. Raleigh, 1875. W. C. Kerr. App. A, p. 3, pl. 1, fig. 8. T. A. Conrad.

Formation: Cretaceous.

Location: Snow Hill, Greene county, N. C.

Trigonodus (?) productus n. s. Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, pp. 135, 136, pl. 17, figs. 7, 7a, b. Montreal, 1889. J. F. Whiteaves.

Formation: Triassic.

Location: Liard river, about thirty miles below Devil's portage, Canada.

Tritonidea (subgen. Swainson) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 378. Wash., 1876. F. B. Meek.

Tritonium (Link) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 94. Phila., 1864. W. M. Gabb.

— **californicum** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 154, pl. 26, fig. 33. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Tejon, Cal.

— **diegoensis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 95, pl. 18, fig. 44. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: San Diego, Cal.

— **hornii** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 94, pl. 28, fig. 208. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon; Cochran's, near Mount Diablo, Cal.

— **paucivaricatum** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 2, p. 95, pl. 28, figs. 209, 209a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon, Cal.

— **whitneyi** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 96, pl. 28, figs. 210, 210a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Alizos creek, near Fort Tejon, Cal.

— **(Lagena ?) edentatum** n. s. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 381. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

Tritonium—Continued.— (*Lagena*?) *interruptum* (Con.)
Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, pp. 281,
282. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— (*Trachytритon*) *fusiformis* n. s.
Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 155 Phila.,
1869. W. M. Gabb.

— (*Trachytритon*) *tejonensis* n. s.
Gabb. 1869.

Geol. Sur. Cal. Paleont., vol. 2, pp. 154, 155, pl.
26, fig. 34. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Arroyo de los Alizos, Tejon, Cal.

Tritonofusus (subgen. Beck) Gabb.
(1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 146. Phila.,
1869. W. M. Gabb.

Trochactæon cylindræus (Stoliczka)
Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1,
pt. 3, p. 218, pl. 28, fig. 6. Montreal, 1884
J. F. Whiteaves.

Formation: Cretaceous.

Location: East end of Maud island, opposite Lead-
ing island.

Trochosmia (M. Edw.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 399. Phila., 1858-1860. W. M. Gabb.

— *conoïdes* (G. & H.) Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-
1860, p. 399, pl. 69, figs. 12-14. Phila., 1858-
1860. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

— ? *granulifera* n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 208, pl. 26, figs.
196, 196a. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Chico creek, Cal.

— ? *inauris* (Mort.) Bölsche. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 215.
Berlin, 1870. Wilh. Bölsche.

Formation: Cretaceous.

Location: Brownville and Squankum, N. J.; Ala-
bama.

— *striata* n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 207, 208, pl.
26, fig. 195. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Near the coal mines at Mount Diablo,
Cal.

Trochus [Linn] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46. Phila.,
1834. S. G. Morton.

Trochus—Continued.— *aleuticus* n. s. Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleu-
tischen Inseln, p. 155, Taf. 12, figs. 2, 3. St.
Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaskan peninsula.

— *leprosus* n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 46, pl. 15, fig.
6. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Prairie bluff, Alabama.

— *mortonii* n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 321.
Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Alabama.

— *orientalis* n. s. Eichwald. (1871.)

Geogr.-Paleont. Bemerk. Halbins. Mang. u. aleu-
tischen Inseln, pp. 155, 156, Taf. 12, fig. 1. St.
Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— *texanus* n. s. Roemer. (1888.)

Paleont. Abhandl. Vierter Band, Heft 4, p. 15,
Taf. 1 [xxx], fig. 13. Berlin, 1888. F. Roemer.

Formation: Cretaceous.

Location: Two miles above the mouth of Barton's
creek, near Austin, Tex.

— (*Anadema*) *gemiferus* n. s. White.
(1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 17, 18, pl. 4, figs.
8, 9. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Near Pence's ranch, Butte county, Cal.

— (*Oxystele*) *euostomus* n. s. White.
(1885.)

Bull. U. S. Geol. Sur., No. 22, p. 12, pl. 5, figs. 9-
11. Wash., 1885. C. A. White.

Formation: Cretaceous.

Location: Shore of Todos Santos bay, Lower Cali-
fornia.

— (*Lam.*) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-
1831, p. 122. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county,
N. J.

— *sp. undet.* Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 282, New Haven,
1830. S. G. Morton.

Formation: Cretaceous.

Location: [New Jersey?]

Trophon (Montfort) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 21. Wash., 1889.
C. A. White.

— *condoni* n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, pp. 21, 22, pl. 3, figs.
4, 5. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Little Cow creek valley, about 18 miles
east of Redding, Shasta county, Cal.

Tropidina (subgen. H. & A. Adams) M. & H. (1865.)

Paleont. Upper Missouri, Smithson. Cont. Knowl., vol. 14, No. 172, p. 113. Wash., 1865. Meek & Hayden.

Tropidocardium (subgen. Roem.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 166. Wash., 1876. F. B. Meek.

Truncatulina (d'Orb) Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsber. 1861, Band XLIV, p. 338. Wien, 1862. A. E. Reuss.

— **dekayi** n. s. Reuss. (1861.)

Math.-Naturw. Cl. Kaiserl. Akad. Wiss. Sitzungsber. 1861, Band XLIV, p. 338, Taf. VII, fig. 6. Wien 1862. A. E. Reuss.

Formation: Cretaceous.

Location: New Jersey.

Tuba ? (Lea) Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 289. Phila., 1858-1860. T. A. Conrad.

— **bella** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 289, 290, pl. 46, fig. 38. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

Tubulipora megaera n. s. Lonsdale. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, pp. 69, 70, figs. a, b, p. 69. London, 1845. William Lonsdale.

Formation: Cretaceous.

Location: Timber creek, N. J.

Tubulostium dickhauti White. (1881.)

Proc. U. S. Nat. Mus., vol. 4, p. 138, pl. 1, figs. 12, 13. Wash., 1881. Smithsonian. Misc. Coll., vol. 22. Wash., 1882. C. A. White.

Tulotoma (Haldeman) White. (1876.)

Rep. Geol. Uinta Mts., p. 134. Wash., 1876. C. A. White.

— **thompsoni** n. s. White. (1876.)

Rep. Geol. Uinta Mts., p. 134. Wash., 1876. C. A. White.

Formation: Tertiary [Cretaceous].

Location: [Southern Wyoming, west of the Rocky mountains, and also east of the same in Colorado.]

— **thompsoni** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 172. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, Colo.

— **thompsoni** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Terr., p. 221. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

Tulotoma—Continued.— **thompsoni** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Part 1, pp. 100, 101, pl. 28, figs. 2a-h. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.; also in the valley of Crow creek, east of the Rocky mountains in Colorado.

— **thompsoni** White. (1883.)

Third Ann. Rep. U. S. Geol. and Geogr. Sur., p. 467, pl. 24, figs. 17-22. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Northern Colorado, east of the Rocky mountains; Southern Wyoming, west of the Rocky mountains.

Turbinella (Lam.) Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94. Phila., 1861. W. M. Gabb.

— **crassitesta** n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 157, 158, pl. 26, fig. 37. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Martinez, Cal.

— **parva** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94. pl. 2, fig. 10. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Monmouth county, N. J.

— **subconica** n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94, pl. 2, fig. 6. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Monmouth county, N. J.

Turbinolia (Lam.) Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 81. Phila., 1834. S. G. Morton.

— **inauris** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 81. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Alabama and New Jersey.

— **texana** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 144, pl. 2, figs. 3a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: Between El Paso and Frontera [Tex.].

— **? texana** (Con.) Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, p. 276. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.

— (Lam.) Say. (1820.)

Am. Jour. Sci., 1st ser., vol. 2, p. 45. New Haven, 1820. Thomas Say.

Formation: [Cretaceous.]

Location: New Jersey.

Turbinopsis n. g. Conrad. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d ser., 1858-1860, p. 289. Phila., 1858-1860. T. A. Conrad.

— **depressa** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 321. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Crosswicks, N. J., and at the Delaware and Chesapeake canal.

— **depressa** (Gabb) Conrad. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 45. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— **hilgardi** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci. Phila., vol. 4, 2d ser., 1858-1860, p. 289, pl. 46, fig. 29. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— **hilgardi** (Con.) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 300. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey, Delaware, Alabama, and Mississippi.

Turbo [Linn] Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 9. Phila., 1870. W. M. Gabb.

— ? **elevatus** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, pp. 9, 10, pl. 3, fig. 5. Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Volcano about thirty miles southeast of Walker's lake, Nev.

— **mudgeanus** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 313. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **nebrascensis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 64. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from mouth, Nebr.

— ? **regius** n. s. Gabb. (1869.)

Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 9, pl. 5, fig. 4. Phila., 1870. W. M. Gabb.

Formation: Jurassic.

Location: Volcano, about thirty miles southeast of Walker's lake, Nev.

— **tenuilineatus** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, pp. 64, 65. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Moreau trading post, Nebr.

— (Lam.) Morton. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 122. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county, N. J.

Turbonilla [Risso] Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 287. Phila., 1858. T. A. Conrad.

— (**Chemnitzia** ?) **coalvillensis** n. s. Meek. (1873.)

Sixth Ann. Rep. Geol. and Geogr. Sur. Terr., pp. 505, 506. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— (**Chemnitzia** ?) **coalvillensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— (**Chemnitzia** ?) **coalvillensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 250. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Hilliard station, Wyo.

— (**Chemnitzia**) **coalvillensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 305, 306, pl. 9, figs. 5a, b. Wash., 1879.

C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— (**Chemnitzia**) **corona** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 287, pl. 46, fig. 50. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— (**Chemnitzia**) **melanopsis** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 287, 288, pl. 46, fig. 35. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

— (**Chemnitzia**) **melanopsis** (Con. ?) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of one-hundredth meridian, vol. 4, pt. 1, pp. 197, 198, pl. 18, fig. 10a. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Near the west crossing of Virgin river, Utah.

— (**Chemnitzia**) **spillmani** n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 287, pl. 46, fig. 48. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

Turnus n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 145, 146. Phila., 1864. W. M. Gabb.

Turnus—Continued.

- (Gabb) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 254. Wash., 1876. F. B. Meek.
- **plenus** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 146, pl. 22, fig. 116. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: North fork of Cottonwood creek, Cal.
- **sphenoideus** n. s. White. (1876.)
Rep. Geol. Uinta Mts., pp. 117, 118. Wash., 1876. C. A. White.
Formation: Cretaceous.
Location: Upper Kanab, Utah.
- (**Goniochasma**) **stimpsoni** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 256, 257, pl. 30, figs. 9a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Muscle Shell river, Idaho.
- (**Xylophagella**) **contortus** Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 304. Phila., 1876. W. M. Gabb.
Formation: Cretaceous.
- (**Xylophagella**) **elegantulus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 257, 258, pl. 30, fig. 10a-e. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Muscle Shell river, Idaho.
- Turrilites** [Lam.] Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.
- **alternatus** n. s. Tuomey. (1854.)
Proc. Acad. Nat. Sci., Phila., vol. 7, sp. 168, 169. Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: Noxubie county, Miss.
- **brazoensis** n. s. Roemer. (1849.)
Texas, p. 415. Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Thirty miles above Torrey's trading house on Brazos river, Tex.
- **brazoensis** Roemer. (1852.)
Kreide. von Texas, p. 37, Taf. 3, fig. 2. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Left bank of Brazos river, thirty miles above Torrey's trading house.
- **helicinus** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp. 191, 192. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Chatfield point and Corsicana, Navarro county, Tex.
- **oregonensis** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 138. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Crooked creek of the Des Chutes, Oregon.

Turrilites—Continued.

- **spinifera** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 284. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Eufaula, Ala.
- **splendens** n. s. Shumard. (1861.)
Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 191. Boston, 1862. B. F. Shumard.
Formation: Cretaceous.
Location: Chatfield point and near Corsicana, Navarro county, Tex.
- ? **umbilicatus** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 56. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- (**Helicoceras**) **cochleatus** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 55, 56. Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Great bend of the Missouri.
- **sp. undet.** Owen. (1860.)
Second Rep. Geol. Rec. Ark., pl. 8, fig. 2. Phila., 1860. D. D. Owen.
Formation: Cretaceous.
Location: Arkansas.
- **sp. undet.** Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 73, pl. 20, fig. 201. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Near Jacksonville, Oregon.
- Turris** (Bolton) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 381. Wash., 1876. F. B. Meek.
- **claytonensis** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 92, 93, pl. 18, fig. 46. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Above the "Clark" or upper coal vein, near Clayton, Contra Costa county, Cal.
- **minor** (E. & S.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 384, 385, pl. 31, figs. 9a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, Mont., one hundred and fifty miles from its mouth.
- **ripleyana** n. s. Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332, pl. 35, figs. 21, 29. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- (**Rumphius**) Conrad. (1858.)
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 332. Phila., 1855-1858. T. A. Conrad.

Turris—Continued.— (**Drillia**) **varicostata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 93, pl. 18, fig. 47.

Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Clayton, Contra Costa county, Cal.

— (**Surcula**) ? **contortus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 385, 386, pl. 31, figs. 7a-c; fig. 49, p. 385. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river, Dak.

— (**Surcula**) ? **hitzi** n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 386-388, fig. 50, p. 387. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Opposite Fort Shea, on the Upper Missouri.

Turritella [Lam.] Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 47, Phila., 1834. S. G. Morton.

— **altilis** n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

— **chicoensis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 133, 134, pl. 21, fig. 91. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Chico creek, Butte county, Cal.

— **coalvillensis** n. s. Meek. (1873.)

Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 502, 503. Wash., 1873. F. B. Meek.

Formation: Cretaceous.

Location: Coalville, Utah.

— **coalvillensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **coalvillensis** (Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 315, 316, pl. 9, fig. 4a. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— **convexa** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 70. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Yellowstone river, one hundred and fifty miles from mouth, Nebr.

— **corsicana** n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 196. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Corsicana and Chatfield point, Navarro county, Tex.

Turritella—Continued.— **encrinoides** n. s. Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 47, pl. 3, fig. 7.

Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey and Alabama.

— **encrinoides** (Morton) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 301.

Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— **fastigiata** n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 169. Phila., 1856. M. Tuomey.

Formation: Cretaceous.

Location: Noxubie county, Mississippi.

— **granulicosta** n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 363.

Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

— **hardemanensis** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 392, pl. 68, figs. 15. Phila., 1858-1860.

W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tenn.

— **inbricata** n. s. Troost. (1840.)

Fifth Geol. Rep. Tenn., p. 56. Nashville, 1840. G. Troost.

Formation: Cretaceous.

Location: Near Purdy, McNairy county, Tenn.

— **infralineata** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 131, 132, pl. 20, fig. 87. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: North fork of Cottonwood creek, Shasta county; Orestimba canyon, Stanislaus county, Cal.

— **irrorata** n. s. Conrad. (1855.)

Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 268. Phila., 1856. T. A. Conrad.

Formation: Cretaceous.

Location: Between El Paso and Frontera? [Tex.].

— **kansasensis** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 312, 313. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **leonensis** n. s. Conrad. (1857.)

Rep. U. S. and Mex. Bound. Sur., vol. 1, pt. 2, p. 165, pl. 21, figs. 7a, b. Wash., 1857. T. A. Conrad.

Formation: Cretaceous.

Location: [Texas.]

— **marnochi** n. s. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 314, 315, pl. 7, figs. 5a, b. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Vicinity of Helotes, Bexar county, Tex.

Turritella—Continued.

- **martinezensis** n. s. Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, pp. 169, 170, pl. 28, fig. 51. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- **moreauensis** n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., for 1856, p. 70. Phila., 1857. Meek & Hayden.
Formation: Cretaceous.
Location: Moreau river, Nebr.
- **multilineata** n. s. E. & S. (1857.)
Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, pp. 41, 42. St. Louis, 1856, 1860. Evans & Shumard.
Formation: Cretaceous.
Location: Moreau and Grand rivers.
- **planilateris** n. s. Conrad. (1857.)
Rep. U. S. and Mex. Bound. Sur., vol. 1. pt. 2, p. 158, pl. 14, fig. 1a, b. Wash., 1857. T. A. Conrad.
Formation: Cretaceous.
Location: [Texas.]
- **pumila** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 392, pl. 68, fig. 14. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Hardeman county, Tenn.
- **robusta** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 135, 136, pl. 21, fig. 94. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.
- **saffordi** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 392, pl. 68, fig. 11. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Hardeman county, Tenn.
- **saffordii** Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 135, pl. 21, fig. 93. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Six miles northeast of Suisun, Solano county; south of Clear lake, Lake county; near Martinez, Cal.
- **secta** n. s. Conrad. (1855.)
Proc. Acad. Nat. Sci., Phila., for 1854, 1855, p. 268. Phila., 1856. T. A. Conrad.
Formation: Miocene [Cretaceous?].
Location: Near Mullica Hill, N. J.
- **seriatim-granulata** n. s. Roemer. (1849.)
Texas, pp. 413, 414, Bonn, 1849. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.
- **seriatim-granulata** Roemer. (1852.)
Kreide. von Texas, p. 39, Taf. 4, figs. 12a, b. Bonn, 1852. F. Roemer.
Formation: Cretaceous.
Location: Fredericksburg, Tex.

Turritella—Continued.

- **seriatim-granulata** (Roem.) Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 132, 133, pl. 20, fig. 88. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs; Cottonwood creek, Shasta county; Siskiyou mountains, Siskiyou county, Cal.
- **seriatim-granulata** (Roem.) Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 263. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Sierra de las Conchas, near Arivechi, Sonora, Mexico.
- **spironema** n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 503, 504. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- **spironema** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- **spironema** (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 31, 32, pl. 12, fig. 3a. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- **tennesseensis** n. s. Gabb. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 392, pl. 68, fig. 13. Phila., 1858-1860. W. M. Gabb.
Formation: Cretaceous.
Location: Hardeman county, Tenn.
- **tippana** n. s. Conrad.
Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333, pl. 35, fig. 19. Phila., 1855-1858. T. A. Conrad.
Formation: Cretaceous.
Location: Owl creek, three miles north of the town of Ripley, Miss.
- **tippana** Conrad. (1860.)
Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 285. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- **trilira** n. s. Conrad. (1860.)
Jour. Acad. Nat. Sci. Phila., vol. 4, 2d ser., 1858-1860, p. 285. Phila., 1858-1860. T. A. Conrad.
Formation: Cretaceous.
Location: Tippah county, Miss.
- **veatchii** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, p. 133, pl. 20, fig. 90. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Tuscan springs, Tehama county, Cal.

Turritella—Continued.

- **vertebroides** n. s. Morton. (1834.)
 Synop. Org. Rem. Cret. Gr. U. S., p. 47, pl. 3,
 fig. 13. Phila., 1834. S. G. Morton.
 Formation: Cretaceous.
 Location: New Jersey and Alabama.
- **uvasana** n. s. Conrad. (1855.)
 Rep. Expl. and Sur. R. R. Mississippi River to
 Pacific Ocean, App. Prelim. Geol. Rep. of W. P.
 Blake, Pal., pp. 10, 11. Wash., 1855. T. A.
 Conrad.
 Formation: Eocene [Cretaceous].
 Location: Cañada de las Uvas.
- **uvasana** Conrad. (1856.)
 Rep. Expl. and Sur. R. R. Mississippi River to
 Pacific Ocean, vol. 5, App., pp. 321, 322, pl. 2,
 fig. 12. Wash., 1856. T. A. Conrad.
 Formation: Eocene [Cretaceous].
 Location: Cañada de las Uvas.
- **uvasana** (Con.) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 134, pl. 21, fig.
 22. Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Hills from Bull's Head point to Clay-
 ton, Contra Costa county; east of the mouth of
 the Canada de las Uvas, Los Angeles county,
 near Martinez, Cal.
- **uvasana** (Con.) White. (1875.)
 Rep. Geogr. and Geol. Expl. and Sur., west of
 One-hundredth Meridian, vol. 4, pt. 1, p. 195,
 pl. 18, figs. 11a, b. Wash., 1875. C. A. White.
 Formation: Cretaceous.
 Location: Southeast of Paria, Utah.
- **winchelli** n. s. Shumard. (1861.)
 Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, pp.
 196, 197. Boston, 1862. B. F. Shumard.
 Formation: Cretaceous.
 Location: Near Corsicana and Chatfield point,
 Navarro county, Texas.
- (**Aclis** ?) **micronema** (Meek) White.
 (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., p. 238. Wash., 1879. C. A. White.
 Formation: Cretaceous.
 Location: Coalville, Utah.
- (**Aclis** ?) **micronema** (Meek) White.
 (1879.)
 Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
 Terr., p. 316, pl. 9, fig. 8a. Wash., 1879. C. A.
 White.
 Formation: Cretaceous.
 Location: Coalville, Utah.
- [Lam.] Say. (1820.)
 Am. Jour. Sci., 1st ser., vol. 2, p. 44. New
 Haven, 1820. Thomas Say.
 Formation: Cretaceous.
 Location: New Jersey.
- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 281. New Haven,
 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: Deep cut of the Chesapeake and Dela-
 ware canal.

Turritella—Continued.

- **sp. undet.** Morton. (1830.)
 Am. Jour. Sci., 1st ser., vol. 17, p. 281. New
 Haven, 1830. S. G. Morton.
 Formation: Cretaceous.
 Location: [New Jersey?]
- **sp. undet.** Roemer. (1849.)
 Texas, p. 414. Bonn, 1849. F. Roemer.
 Formation: Cretaceous.
 Location: Ford near New Braunfels, Tex.
- **sp. undet.** Roemer. (1852.)
 Kreide. von Texas, p. 39. Bonn, 1852. F. Roemer.
 Formation: Cretaceous.
 Location: Ford of the Guadalupe, New Braunfels,
 Tex.
- **sp. undet.** Credner. (1870.)
 Zeitsch. Deutsch. Geol. Ges., Band 22, p. 257.
 Berlin, 1870. H. Credner.
 Formation: Cretaceous.
 Location: New Jersey.
- Tylostoma** (Sharpe) Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, p. 261. Phila.,
 1869. W. M. Gabb.
- **mutabilis** n. s. Gabb. (1869.)
 Geol. Sur. Cal. Paleont., vol. 2, pp. 261, 262, pl. 35,
 fig. 6, a-c. Phila., 1869. W. M. Gabb.
 Formation: Cretaceous.
 Location: Sierra de las Conchas, near Arivechi,
 Sonora, Mexico.
- **princeps** n. s. White. (1880.)
 Proc. U. S. Nat. Mus., vol. 3, pp. 140-142, pl. 2,
 figs. 1, 2. Wash., 1881. C. A. White.
 Formation: Cretaceous.
 Location: Zapotitlan salt works, about six miles
 southwestward from the town of Tehuacan, in
 the state of Puebla, Mexico, and about fifteen
 miles inland from the gulf coast.
- **princeps** White. (1884.)
 La Naturaleza, Tomo 6, pp. 219-221, figs. 6, 7.
 Mexico, 1884. C. A. White.
- Typhis** (Montf.) Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 82. Phila., 1864.
 W. M. Gabb.
- **antiquus** n. s. Gabb. (1864.)
 Geol. Sur. Cal. Paleont., vol. 1, p. 82, pl. 18, fig. 31,
 Phila., 1864. W. M. Gabb.
 Formation: Cretaceous.
 Location: Bull's Head point, northeast of Mar-
 tinez, Cal.
- Uintacrinus** n. g. Grinnell. (1876.)
 Am. Jour. Sci., 3d ser., vol. 12, p. 81. New
 Haven, 1876. G. B. Grinnell.
- **socialis** n. s. Grinnell. (1876.)
 Am. Jour. Sci., 3d ser., vol. 12, pp. 81-83, pl. 4.
 New Haven, 1876. G. B. Grinnell.
 Formation: Cretaceous.
 Location: Uinta mountains and Kansas.
- **socialis** (Grinnell) Meek. (1876.)
 Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 2, No.
 4, pp. 375-378, figs. A and B text. Wash., 1876.
 F. B. Meek.
 Formation: Cretaceous.
 Location: Trego county, Kans.

Unicardium (d'Orb.) Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 50. Phila., 1864.
F. B. Meek.

— ? gibbosum n. s. Meek. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 50, 51, pl. 8, figs.
8, 8a. Phila., 1864. F. B. Meek.

Formation: Jurassic.

Location: Genesee valley, Plumas county, Cal.

Unio (Retzius) Meek. (1860.)

Rep. Expl. Great Basin Terr. Utah, p. 361. Wash.,
1876. F. B. Meek.

— alatoides n. s. Lea. (1868.)

Proc. Acad. Nat. Sci., Phila., for 1868, p. 164,
Phila., 1868. Isaac Lea.

Formation: Cretaceous.

Location: About six miles northeast of Camden,
N. J.

— alatoides (Lea) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 249, 250, pl. 33,
figs. 3, 4,; pl. 34, fig. 6. Wash., 1885. R. P.
Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, N. J.

— albertensis n. s. Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can., Pa-
leont., vol. 1, pt. 1, p. 3, pl. 1, fig. 1. Montreal,
1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Upper Belly river, Alberta, Northwest
Territory, seven miles above the mouth of the
Old Man river, Canada.

— aldrichi n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No.
3, pp. 710, 711. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Union Pacific
railroad, Wyo.

— aldrichi White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— aldrichi White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 62, 63, pl. 29, figs. 2a, b. Wash.,
1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— aldrichi White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 15, figs.
4, 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyo.

— belliplicatus n. s. Meek. (1870.)

Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 430.
Phila., 1871. F. B. Meek.

Formation: Tertiary [Cretaceous].

Location: Limestone hill, Bear river.

— belliplicatus Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 165-167, pl. 16, figs. 4, 4a. Wash., 1877.
F. B. Meek.

Formation: Cretaceous.

Location: Limestone hill, on Bear river, Utah;
Gilmer, Wyo.

Unio—Continued.**— belliplicatus (Meek) White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 242. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

— belliplicatus (Meek) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 71. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, both above and be-
low Evanston, Wyo.

— belliplicatus (Meek) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 430, pl. 6, figs.
1-3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming and adjacent
parts of Utah.

— brachyopisthus n. s. White. (1876.)

Rep. Geol. Uinta Mts., p. 126. Wash., 1876.
C. A. White.

Formation: Tertiary [Cretaceous].

Location: Black buttes, Wyo.

— brachiopisthus White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— brachyopisthus White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 64, pl. 22, figs. 2a, b. Wash., 1880.
C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— brachyopisthus White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 16,
figs. 7, 8. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

— cariosoides n. s. Lea. (1868.)

Proc. Acad. Nat. Sci., Phila., for 1868, p. 164.
Phila., 1868. Isaac Lea.

Formation: Cretaceous.

Location: About six miles northeast of Camden,
N. J.

— cariosoides (Lea) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 247, pl. 32, fig. 3.
Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, N. J.

— consuetus n. s.? Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pa-
leont., vol. 1, pt. 1, pp. 59-61; pl. 9, figs. 4, 4a.
Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Milk River ridge, Red Deer river,
township 21, range 12, west of fourth princi-
pal meridian, Canada.

— couesi White. (1879.)*

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

*See Bull. U. S. Geol. and Geogr. Sur. Terr., vol. III, p. 605. Wash., 1877.

Unio—Continued.

- **couesi** White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 64, 65, pl. 27, fig. 1a. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Black Buttes station, Wyo.
- **couesii** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 16, fig. 1. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Black Buttes, Wyo.
- **cristonensis** n. s. Meek. (1875.)
Ann. Rep. U. S. Geogr. Expl. and Sur. West 100th Meridian for 1875, p. 83. Wash. 1875. F. B. Meek.
Formation: Triassic.
Location: Gallinas creek, N. Mex.
- **cristonensis** (Meek) Cope. (1877.)
U. S. Geol. Sur. West 100th Meridian, vol. 4, pt. 2, p. 9, pl. 23, figs. 2-5. Wash. 1877. E. D. Cope.
Formation: Triassic.
Location: Gallinas creek, N. Mex.
- **cristonensis** (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 425, pl. 3, fig. 5. Wash., 1883. C. A. White.
Formation: Triassic.
Location: Gallinas creek, N. Mex.
- **cryptorhynchus** n. s. White. (1877.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 3, p. 600. Wash., 1877. C. A. White.
Formation: Cretaceous.
Location: Dog creek, a tributary of the Upper Missouri river, Montana.
- **cryptorhynchus** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pp. 218, 219. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black Buttes station, Wyo.
- **cryptorhynchus** White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 68, 69, pl. 24, figs. 1a, b. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Dog creek, a tributary of the upper Missouri river.
- **cryptorhynchus** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 431, pl. 14, figs. 6, 7. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Judith river beds.
- **danæ** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 517, 518, pl. 41, figs. 3, a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Judith river.
- **danæ** (M. & H.?) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 219. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Black Buttes station, Wyo.

Unio—Continued.

- **danæ** (M. & H.?) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 68, pl. 27, figs. 2a, b. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Black Buttes station, Wyo.
- **danæ** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 431, pl. 17, figs. 1-3. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Black buttes, Wyo.
- **danæ** (M. & H.?) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 18, figs. 1, 2. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Black buttes, Wyo.
- **danæ** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 6. Montreal, 1885. J. F. Whiteaves.
Formation: Laramie.
Location: Bow river, mouth of East Arrowwood creek, also Bow river, four and eight miles west of Blackfoot crossing; Belly river west of crossing of MacLeod-Benton trail; Pincher creek; Knee Hills creek, township 29, range 22, west of fourth principal meridian, Canada.
- **danæ** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 59. Montreal 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South shore of the Belly river, above Coal banks, Canada.
- **danæ** (M. & H.) Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 65. Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Belly river, northwest angle of Driftwood bend, Canada.
- **danai** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 145. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr. [Mont.]
- **deweyanus** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, pp. 145, 146. Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr. [Mont.]
- **deweyanus** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 519, pl. 41, figs. 2a-c. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **deweyanus** (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 71. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.

Unio—Continued.**— deweyanus (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 431, pl. 17, figs. 4, 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Judith river beds.

— deweyanus (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 66. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, one mile below the mouth of the Bow river, Canada.

— endlichi n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No. 3, pp. 604, 605. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

— endlichi White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— endlichi White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 66, 67, pl. 26, fig. 1a, b. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— endlichi White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 15, figs. 1, 2. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

— felchii n. s. White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 16, pl. 1, figs. 1-5. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Eight miles north of Canyon city, Colo.

— gallinensis n. s. Meek. (1875.)

Ann. Rep. U. S. Geogr. Expl. and Sur. West 100th Meridian for 1875, p. 84. Wash. 1875. F. B. Meek.

Formation: Triassic.

Location: Gallinas creek, N. Mex.

— gallinensis (Meek) Cope. (1877.)

U. S. Geogr. Sur. West 100th Meridian, vol. 4, pt. 2, p. 9, pl. 23, figs. 6, 6a. Wash. 1877. E. D. Cope.

Formation: Triassic.

Location: Gallinas creek, N. Mex.

— goniambonatus n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, pp. 709, 710. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Union Pacific railroad, Wyo.

Unio—Continued.**— goniambonatus White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— goniambonatus White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 63, 64, pl. 29, figs. 1a, b. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— goniambonatus White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 19, figs. 3, 4. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

— gonibonotus n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 116, 117. Wash., 1876. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, Utah.

— gonionotus White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., Part 1, pp. 71, 72, pl. 26, figs. 2a-e. Wash. 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Kanab, southern Utah.

— gonionotus White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 13, figs. 7-10. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southern Utah.

— holmesianus n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur., Terr., vol. 3, No. 3, p. 604. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

— holmesianus White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur., Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— holmesianus White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr. pt. 1, pp. 67, 68, pl. 22, figs. 4a-e. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black buttes station, Wyo.

— holmesianus White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 16, figs. 2-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyo.

— hubbardii n. s. Gabb. (1869.)

Geol. Sur. Cal. Paleont., vol. 2, pp. 190, 191, pl. 30, fig. 86. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: Nanaimo coal mine, Vancouver island.

Unio—Continued.

- **hubbardi** (Gabb) Whiteaves. (1876.)
Geol. Sur. Can. Mes. Foss., vol. 1, pt. 1, pp. 65-68,
pl. 9, fig. 13. Montreal, 1876. J. F. Whiteaves.
Formation: Cretaceous.
Location: Queen Charlotte islands.
- **hubbardi** (Gabb) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 427, pl. 5,
figs. 2, 3. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Vancouver island.
- **hubbardi** (Gabb) Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can. Mes. Fos. vol. 1, pt.
3, p. 230. Montreal, 1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: Hooper's creek, or King's tunnel,
Cowgitz' coal mine.
- **humerosoides** n. s. Lea. (1868.)
Proc. Acad. Nat. Sci., Phila., for 1868, pp. 163,
164. Phila., 1868. Isaac Lea.
Formation: Cretaceous.
Location: About six miles northeast of Camden,
N. J.
- **humerosoides** (Lea) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 284, pl. 31,
fig. 4. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **iridoides** n. s. White. (1886.)
Bull. U. S. Geol. Sur. No. 29, pp. 17, 18, pl. 2, figs.
3, 4. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.
- **lapilloides** n. s. White. (1886.)
Bull. U. S. Geol. Sur. No. 29, p. 18, pl. 2, figs. 5,
6. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.;
Como, Wyo.
- **ligamentinoides** n. s. Lea. (1868.)
Proc. Acad. Nat. Sci., Phila., for 1868, p. 164.
Phila., 1868. Isaac Lea.
Formation: Cretaceous.
Location: About six miles northeast of Camden,
N. J.
- **ligamentinoides** (Lea) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 249, pl. 32, fig.
4; pl. 34, fig. 8. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **macropisthus** n. s. White. (1886.)
Bull. U. S. Geol. Sur. No. 29, p. 17, pl. 2, fig. 7.
Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.
- **martini** (d'Orb) Eichwald. (1871.)
Geog.-Paleont. Bemerk. Halbins. Mang. u. aleu-
tischen Inseln, pp. 168, 169, Taf. 16, figs. 28,
29. St. Petersburg, 1871. E. Eichwald.
Formation: Cretaceous.
Location: Alaska.

Unio—Continued.

- **mendax** n. s. White. (1877.)
Bull. U. S. Geol. and Geogr. Sur., Terr., vol. 3,
No. 3, pp. 605, 606. Wash., 1877. C. A.
White.
Formation: Cretaceous.
Location: Wales, Utah; also canyon of Desolation
of Green river, Utah.
- **mendax** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 18,
figs. 3-5. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Canyon of Desolation, and Wales, Utah.
- **nasutoides** n. s. Lea. (1868.)
Proc. Acad. Nat. Sci., Phila., for 1868, p. 163,
Phila., 1868. Isaac Lea.
Formation: Cretaceous.
Location: About six miles northeast of Camden,
N. J.
- **nasutoides** (Lea) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 244, 245, pl. 34,
figs. 4, 5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **nucalis** n. s. M. & H. (1858.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 52.
Phila., 1859. Meek & Hayden.
Formation: Cretaceous.
Location: Southwest base of Black hills.
- **nucalis** M. & H. (1865.)
Paleont. Upper Missouri, Smithsonian. Cont. Knowl.,
vol. 14, No. 172, pp. 92, 93, pl. 3, figs. 13a-c.
Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Southwest base of Black hills.
- **nucalis** M & H. White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 426, pl. 3, figs.
2-4. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Vicinity of Black hills.
- **nucalis** M. & H. White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 19, pl. 3, figs.
3-7. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Como, Wyo.; Black hills, Dak.
- **penultimus** n. s. Gabb. (1864.)
Geol. Sur. Cal. Paleont., vol. 1, pp. 182, 183, pl.
24, fig. 164. Phila., 1864. W. M. Gabb.
Formation: Cretaceous.
Location: Peacock coal mine, Mount Diablo, Con-
tra Costa county, Cal.
- **penultimus** (Gabb) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 427, pl. 5, fig. 1.
Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: California.
- **petrinus** n. s. White. (1876.)
Rep. Geol. Uinta Mt., p. 125. Wash., 1876. C.
A. White.
Formation: Cretaceous.
Location: Black buttes, Wyo.

Unio—Continued.

—*præanodontoides* n. s. Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, p. 250, pl. 31, fig. 2.
Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, N. J.

—*primævus* n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur., Terr., vol. 3,
No. 3, pp. 599, 600. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: South of Cow island, Upper Missouri
river, Mont.

—*primævus* White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 70, pl. 29, figs. 3a, b. Wash.,
1880. C. A. White.

Formation: Cretaceous.

Location: South of Cow island, Upper Missouri
river, Mont.

—*primævus* White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 14,
figs. 4, 5. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Judith river beds.

—*primævus* (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can. Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 59. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Branch of East fork of Milk river,
township 1, range 27, west of third principal
meridian, Canada.

—*priscus* n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 117.
Phila., 1857. Meek & Hayden.

Formation; Tertiary [Cretaceous].

Location: Yellowstone river, forty miles above
the mouth.

—*priscus* (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 516, 517,
pl. 43, figs. 8a-d. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On Yellowstone river, forty miles
above its mouth; near mouth of Judith river,
Mont.

—*priscus* (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr. pt. 1, p. 70. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Valley of the Yellowstone river.

—*priscus* (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 14,
fig. 1. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

—*priscus* (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 26, 27. Montreal, 1885.
J. F. Whiteaves.

Formation: Cretaceous.

Location: Wood End depot, Souris river, Canada.

Unio—Continued.

—*priscus* (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 65, pl. 10, fig. 3. Montreal,
1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Belly river, two miles above Wood-
pecker island, Canada.

—*proavitus* n. s. White. (1877.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3,
No. 3, pp. 603, 604. Wash., 1877. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyo.

—*proavitus* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

—*proavitus* White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 65, 66, pl. 22, figs. 3a-d.
Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

—*proavitus* White. (1883.)

Third Ann. Rep. U. S. Geol. and Geogr. Sur., p.
433, pl. 13, figs. 3-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black Buttes, Wyo.

—*propheticus* n. s. White. (1876.)

Rep. Geol. Uinta Mts., pp. 125, 126. Wash., 1876.
C. A. White.

Formation: Tertiary [Cretaceous].

Location: Black buttes, Wyo.

—*propheticus* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 218. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

—*propheticus* White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.,
Terr., pt. 1, p. 65, pl. 22, fig. 5a. Wash., 1880.
C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

—*propheticus* White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 433, pl. 15,
fig. 3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Black buttes, Wyo.

—*radiatoides* n. s. Lea. (1868.)

Proc. Acad. Nat. Sci., Phila., for 1868, p. 163.
Phila., 1868. Isaac Lea.

Formation: Cretaceous.

Location: About six miles northeast of Camden,
N. J.

—*radiatoides* (Lea) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 245, 246, pl. 34,
figs. 1-3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Fish house, Camden county, N. J.

Unio—Continued.

- **rectoides** n. s. Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 250, 251, pl. 32,
figs. 1, 2. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **roanokoides** n. s. Lea. (1868.)
Proc. Acad. Nat. Sci., Phila., for 1868, p. 164.
Phila., 1868. Isaac Lea.
Formation: Cretaceous.
Location: About six miles northeast of Camden,
N. J.
- **roanokoides** (Lea) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 248, 249, pl.
33, figs. 1, 2; pl. 34, fig. 7. Wash., 1885. R. P.
Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **senectus** n. s. White. (1877.)
Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 3, No.
3, pp. 600, 601. Wash., 1877. C. A. White.
Formation: Cretaceous.
Location: Dog creek, a tributary of the Upper
Missouri river, Mont.
- **senectus** White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 69, pl. 28, figs. 1a-c. Wash.,
1883. C. A. White.
Formation: Cretaceous.
Location: Valley of Dog creek, a tributary of the
Upper Missouri river.
- **senectus** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 19,
figs. 1, 2. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Judith river beds.
- **senectus** (White) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, pp. 6, 7. Montreal, 1885. J. F.
Whiteaves.
Formation: Cretaceous.
Location: Bow river, two miles below the mouth
of Jumping Pound river, Canada.
- **senectus** (White) Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont.,
vol. 1, pt. 1, p. 67, pl. 10, fig. 2. Montreal, 1885.
J. F. Whiteaves.
Formation: Cretaceous.
Location: South Saskatchewan, one mile below
the mouth of the Bow river, Canada.
- **stewardi** n. s. White. (1876.)
Rep. Geol. Uinta Mts., p. 110. Wash., 1876. C.
A. White.
Formation: Jurassic.
Location: Flaming gorge of Green river, near the
northern boundary line of Utah.

Unio—Continued.

- **stewardi** White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 426, pl. 3, fig.
1. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Northern Utah.
- **stewardi** White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 19, pl. 3, figs. 1,
2. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.,
near banks of Green river, southern Wyoming.
- **subrotundoides** n. s. Lea. (1868.)
Proc. Acad. Nat. Sci., Phila., for 1868, p. 163.
Phila., 1868. Isaac Lea.
Formation: Cretaceous.
Location: About six miles northeast of Camden,
N. J.
- **subrotundoides** (Lea) Whitfield.
(1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 246, 247, pl. 32,
fig. 5. Wash., 1885. R. P. Whitfield.
Formation: Cretaceous.
Location: Fish house, Camden county, N. J.
- **subspatulata** n. s. M. & H. (1857.)
Proc. Acad. Nat. Sci., Phila., for 1857, p. 146.
Phila., 1858. Meek & Hayden.
Formation: Cretaceous.
Location: Mouth of Judith river, Nebr. [Mont.]
- **subspatulatus** (M. & H.) Meek.
(1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 518, 519,
pl. 41, figs. 1a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **subspatulatus** (M. & H.) White.
(1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 71. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Mouth of Judith river, Mont.
- **subspatulatus** (Meek) White.
(1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 432, pl. 14,
figs. 2, 3. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Judith river beds.
- **supragibbosus** n. s. Whiteaves.
(1885.)
Geol. and Nat. Hist. Sur. Can.; Cont. Can. Paleont.,
vol. 1, pt. 1, pp. 66, 67, pl. 10, fig. 1. Montreal,
1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: South Saskatchewan, one mile below
the mouth of the Bow river, Canada.
- **terræ-rubræ** n. s. Meek. (1875.)
Ann. Rep. U. S. Geogr. Expl. and Sur. west one-
hundredth meridian for 1875, p. 84. Wash.,
1875. F. B. Meek.
Formation: Triassic.
Location: Gallinas creek, N. Mex.

Unio—Continued.

- **terræ-rubræ** (Meek) Cope. (1877.)
U. S. Geogr. Sur. west one-hundredth meridian,
vol. 4, pt. 2, p. 9, pl. 23, figs. 7, 7a. Wash.,
1877. E. D. Cope.
Formation: Triassic.
Location: Gallinas creek, N. Mex.
- **toxonotus n. s.** White. (1886.)
Bull. U. S. Geol. Sur., No. 29, p. 17, pl. 2, figs. 1, 2.
Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.
- **vetusta n. s.** Meek. (1860.)
Proc. Acad. Nat. Sci., Phila., for 1860, p. 312.
Phila., 1861. F. B. Meek.
Formation: Cretaceous.
Location: Bear river, near the mouth of Sulphur
creek, latitude 41° 12' north, longitude 110° 52'
west.
- **vetustus** Meek. (1870.)
Proc. Am. Philos. Soc., vol. 11, 1869, 1870, p. 430.
Phila., 1871. F. B. Meek.
Formation: Tertiary [Cretaceous].
Location: Limestone hill, Bear river.
- **vetustus** Meek. (1876.)
Rep. Expl. Great Basin Terr. Utah, p. 361,
pl. 5, figs. 12, a, b. Wash., 1876. F. B. Meek.
Formation: Cretaceous?
Location: Bear river, near the mouth of Sulphur
creek.
- **vetustus** Meek. (1877.)
Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 164, 165, pl. 17, figs. 5, a-c. Wash., 1877. F.
B. Meek.
Formation: Cretaceous.
Location: Bear river, near the mouth of Sulphur
creek, Wyo.
- **vetustus** (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 242. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, Wyo.
- **vetustus** (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 71. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Bear river valley, both above and below
Evanston, Wyo.
- **vetustus** (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 430, pl. 7, figs.
1-4. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Southwestern Wyoming and adjacent
parts of Utah.
- (**Baphia**?) **nebrascensis n. s.** Meek.
(1871.)
Fourth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 303. Wash., 1871. F. B. Meek.
Formation: Cretaceous.
Location: Opposite Sioux city, on the Missouri,
in Dakota county, Nebr.

Unio—Continued.

- **sp. undet.** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 168. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Crow creek, Colo.
- **sp. undet.** White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 235. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- Unionopsis** (subgen. Swainson) Meek.
(1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 113. Wash.,
1876. F. B. Meek.
- Urosyca n. g.** Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 159. Phila.,
1869. W. M. Gabb.
- **caudata n. s.** Gabb. (1869.)
Geol. Sur. Cal. Paleont., vol. 2, p. 159, pl. 27, fig.
38. Phila., 1869. W. M. Gabb.
Formation: Cretaceous.
Location: Martinez, Cal.
- Vaginulina calcipara** Ehrenberg.
(1854.)
Mikrogeologie, Taf. 32, fig. 7. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **cretæ** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 8. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- **subacuta** Ehrenberg. (1854.)
Mikrogeologie, Taf. 32, fig. 9. Leipzig, 1854.
C. G. Ehrenberg.
Formation: Cretaceous.
Location: Mississippi region.
- Valvata** (Müller) M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 112, 113. Wash., 1865.
Meek & Hayden.
- (Müller) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 590. Wash.,
1876. F. B. Meek.
- **bicincta n. s.** Whiteaves.
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, pp. 25, 26, pl. 3, figs. 3, 8, 8a, b.
Montreal, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Mouth of Blind Man river, township
39, range 27, west of fourth principal meridian,
Canada.
- **filosa n. s.** Whiteaves. (1885.)
Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 25, pl. 3, figs. 7, 7a. Mont-
real, 1885. J. F. Whiteaves.
Formation: Cretaceous.
Location: Pincher creek, mouth of the Blind Man
river, township 39, range 27, west of fourth prin-
cipal meridian, Canada.

Valvata—Continued.

- *? montanaensis* n. s. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 591, 592,
figs. 81-83, p. 591. Wash., 1876. F. B. Meek.
Formation: Cretaceous?
Location: Mouth of Judith river, on the Upper
Missouri, Mont.
- *? montanaensis* (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
pt. 1, p. 102. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- *? montanaensis* (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 470, pl. 27,
fig. 24. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- *nana* n. s. Meek. (1873.)
Sixth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr.,
p. 507. Wash., 1873. F. B. Meek.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- *nana* (Meek) White. (1879.)
Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 238. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *nana* (Meek) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 33, 34, pl. 12, figs. 17a, b. Wash.,
1880. C. A. White.
Formation: Cretaceous.
Location: Carleton's coal mine, Coalville, Utah.
- *nana* (Meek) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 470, pl. 5, figs.
19, 20. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Coalville, Utah.
- *parvula* n. s. M. & H. (1856.)
Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p.
123. Phila., 1857. Meek & Hayden.
Formation: Tertiary [Cretaceous].
Location: Three miles below Fort Union.
- *parvula* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 591. Wash.,
1876. F. B. Meek.
Formation: [Cretaceous].
Location: Three miles below Fort Union, Dak.
- *parvula* (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 102. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- *scabrida* (M. & H. ?) White. (1886.)
Bull. U. S. Geol. Sur. No. 29, p. 22, pl. 4, figs. 1-3,
19. Wash., 1886. C. A. White.
Formation: Jurassic.
Location: Eight miles north of Canyon city, Colo.;
also Black hills of Dakota.

Valvata—Continued.

- *scabrida* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 470, pl. 3, fig.
7. Wash., 1883. C. A. White.
Formation: Jurassic.
Location: Vicinity of the Black hills.
- *subumbilicata* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 590, 591,
pl. 43, figs. 13a-c. Wash., 1876. F. B. Meek.
Formation: [Cretaceous].
Location: Three miles below Fort Union, Dak.
- *subumbilicata* (M. & H.) White. (1880.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 102. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- *subumbilicata* (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 470, pl. 27,
fig. 25. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Upper Missouri river region.
- *? (Tropidina scabrida* n. s. M. & H. (1865.)
Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, p. 113, pl. 4, figs. 2, a, b.
Wash., 1865. Meek & Hayden.
Formation: Jurassic.
Location: Near southwest base of Black hills.
- Vanikoro** (Quoy & Gaim) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 329. Wash.,
1876. F. B. Meek.
- *ambigua* (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 330, 331,
pl. 19, figs. 12a-d. Wash., 1876. F. B. Meek.
Formation: Cretaceous.
Location: Yellowstone river, 150 miles above its
mouth.
- *ambigua* (M. & H.) Whitfield. (1880.)
Rep. Geol. Black Hills of Dak., pp. 430, 431, pl.
12, fig. 14. Wash., 1880. R. P. Whitfield.
Formation: Cretaceous.
Location: On the Cheyenne river, Black hills.
- *pulchella* nom. prov. Whiteaves. (1884.)
Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1,
pt. 3, pp. 215, 216, pl. 27, figs. 4, 4a. Montreal,
1884. J. F. Whiteaves.
Formation: Cretaceous.
Location: East end of Maud island, opposite
Leading island.
- Vanikoropsis** n. g. Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 331. Wash.,
1876. F. B. Meek.
- *suciensis* n. s. White. (1889.)
Bull. U. S. Geol. Sur. No. 51, p. 46, pl. 7, fig. 4.
Wash., 1889. C. A. White.
Formation: Cretaceous.
Location: Sucia Island.

Vanikoropsis—Continued.

- **tuomeyana** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 332, pl. 39,
figs. 2a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Judith river, on the Upper Missouri.

- **tuomeyana** (M. & H.) Whitfield. (1876.)

Rep. Rec. Carroll, Mont., to Yellowstone National Park, p. 145, pl. 2, figs. 11-13. Wash., 1876. R. P. Whitfield.

Formation: Cretaceous.

Location: Near the mouth of Judith river, Mont.

- **tuomeyana** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 49. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Three miles north of Ross coulée, near Irvine station, on the Canadian Pacific railway, Canada.

Vasculum n. g. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 16. Wash., 1889. C. A. White.

- **obliquum n. s. White. (1889.)**

Bull. U. S. Geol. Sur. No. 51, p. 16, pl. 4, figs. 19-21. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Canyon of Chico creek, fifteen miles east of Chico, Butte county, Cal.

Velatella (subgen. Meek) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of One-hundredth Meridian, vol. 4, pt. 1, p. 189. Wash., 1875. C. A. White.

- **baptista** (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 73. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Coulée "about fourteen miles north-eastward from the most eastern of the Three Buttes," near the forty-ninth parallel; Belly river, east side of Driftwood bend, and Belly river, near its junction with the Bow river; south side of Milk river, one mile above the mouth of Pā-kow-ki coulée; South Saskatchewan, one mile below the mouth of the Bow river, Canada.

Veleda n. g. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1871. T. A. Conrad.

- **lintea n. s. Conrad. (1870.)**

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

- **lintea** Conrad. (1875.)

Rep. Geol. Sur. N. C., vol. 1, Raleigh, 1875. W. C. Kerr. App. A, p. 9, pl. 1, fig. 26. T. A. Conrad.

Formation: Cretaceous.

Location: Snow hill, Greene county, N. C.

Veleda—Continued.

- **lintea** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 172, 173, pl. 23, figs. 18-21. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schanck's pits, near Marlboro, N. J.

- **nasuta n. s. Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, p. 217, pl. 28, fig. 23. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Near New Egypt, N. J.

- **tellinoides n. s. Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, pp. 173, 174, pl. 23, fig. 23. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Rev. G. C. Schanck's pits, near Marlboro, Monmouth county, N. J.

- **transversa n. s. Whitfield. (1885.)**

Mon. U. S. Geol. Sur., vol. 9, p. 174, pl. 23, fig. 22. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Marlboro, N. J.

Velletia (Ancylus) minuta n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., vol. 8, for 1856, p. 120. Phila., 1857. Meek & Hayden.

Formation: Tertiary [Cretaceous].

Location: Three miles below Fort Union.

Veloritina n. subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 161. Wash., 1876. F. B. Meek.

Veniella (Stoliczka) White. (1875.)

Rep. Geogr. and Geol. Expl. and Sur. west of One-hundredth Meridian, vol. 4, pt. 1, p. 185. Wash., 1875. C. A. White.

- (Stoliczka) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 148. Wash., 1876. F. B. Meek.

- **conradi** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 144, 145, pl. 19, figs. 8-10. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, and from Rev. G. C. Schanck's pits, near Marlboro, N. J.

- **crassa n. s. Whiteaves. (1879.)**

Geol. Sur. Can. Mes. Foss., vol. 1, pt. 2, pp. 153, 154, pl. 18, fig. 1. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Sucia islands.

- **decisa** (Mort.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 145-147, pl. 19, figs. 15, 16. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Blue Ball, and at the marl pits of I. Stratton, near Mullica Hill, N. J.

- **elevata** (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 148, 149, pl. 19, figs. 6, 7. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

Veniella—Continued.**— goniophora (Meek ms.) White.**

Rep. Geogr. and Geol. Expl. and Sur. west of One-hundredth meridian, vol. 4, pt. 1, p. 185. Wash., 1875. C. A. White.

Formation: Cretaceous.

Location: Southeast of Paria, Utah.

— goniophora n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 152, 153, pl. 4; fig. 4; fig. 12, p. 152. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Missouri river, near Fort Benton.

— humilis (M. & H.) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 182. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Valleys of the Cache la Poudre and Little Thompson creek, Colo.

— humilis (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 414, pl. 10, figs. 7-13. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On the Cheyenne river, near Old Woman fork, Wyo.

— inflata (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 147, 148, pl. 19, figs. 4, 5. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— rhomboidea (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 215, 216, pl. 28, figs. 12, 13. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Burlington county, N. J.

— subovalis (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 150, 151, pl. 19, figs. 1, 2. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Crosswicks, N. J.

— subtumida (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 154, 155, pl. 17, figs. 5a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Yellowstone river.

— trapezoidea (Con.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 151, 152, pl. 19, fig. 3. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Holmdel, N. J.

— trigona (Gabb.) Whitfield. (1885.)

Mon. U. S. Geol. Sur., vol. 9, pp. 149, 150, pl. 19, figs. 11-14. Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Boonton, Monmouth county, and Freehold, N. J.

Veniella—Continued.**— (Venilicardia ?) humilis (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 155, 156, pl. 30, figs. 5a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On a branch of Cheyenne river, near the Black hills, on Cache la Poudre river, Colo.

Venilia n. g. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294. New Haven, 1833. S. G. Morton.

— conradi n. s. Morton. (1833.)

Am. Jour. Sci., 1st ser., vol. 23, p. 294, pl. 8, figs. 1, 2. New Haven, 1833. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— conradi Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., p. 67, pl. 8, figs. 1, 2. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: Arneytown, N. J.; Prairie Bluff, Ala.

— conradi (Morton) Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 313. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Pataula creek, Ga.

— elevata n. s. Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, pp. 74, 75, pl. 1 [3], figs. 7, 7a. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— mortoni n. s. M. & H. (1862.)

Proc. Acad. Nat. Sci., Phila., for 1862, pp. 27, 28. Phila., 1863. Meek & Hayden.

Formation: Cretaceous.

Location: Chippewa point, near Fort Benton, on the Missouri river.

— quadrata n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 364. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Mississippi.

— rhomboidea n. s. Conrad. (1853.)

Jour. Acad. Nat. Sci., Phila., vol. 2, 2d ser., 1850-1854, p. 275, pl. 24, fig. 7. Phila., 1850-1854. T. A. Conrad.

Formation: Cretaceous.

Location: Burlington county, N. J.

— trapezoidea n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 282, pl. 47, figs. 7. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

— trigona n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 324, 325. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: Boonton, N. J.

Venilicardia (subgen. *Stoliczka*) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 149. Wash., 1876. F. B. Meek.

Venus [Linn.] Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860, p. 598. St. Louis, 1856-1860. B. F. Shumard.

— **? abnormis** n. s. Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen Inseln, p. 174, Taf. 16, figs. 19, 20. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Alaska.

— **æquilateralis** n. s. Gabb.

Geol. Sur. Cal. Paleont., vol. 2, p. 184, pl. 30, fig. 76. Phila., 1869. W. M. Gabb.

Formation: Cretaceous.

Location: San Diego, Cal.

— **circularis** n. s. M. & H. (1856.)

Proc. Acad. Nat. Sci., Phila., for 1856, p. 272. Phila., 1857. Meek & Hayden.

Formation: Cretaceous.

Location: Just above the mouth of Milk river, Nebr.

— **costato-squamosa** n. s. Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen, Inseln, pp. 130, 131. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Kodiak island, Alaska.

— **lenticularis** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 162, pl. 30, fig. 246. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Benicia, Cal.

— **meekana** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 394, pl. 68, fig. 23. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Eufaula, Ala.

— **ovalis** (Sow.) Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 235. Berlin, 1870. H. Credner.

Formation: Cretaceous.

Location: Haddonfield, N. J.

— **provida** n. s. Eichwald. (1871.)

Geog.-Paleont. Bemerk. Halbins. Mang. u. aleutischen, Inseln., pp. 131, 132. St. Petersburg, 1871. E. Eichwald.

Formation: Cretaceous.

Location: Unga and St. Paul islands, Alaska.

— **ripleyana** n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 393, 394, pl. 68, fig. 22. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Hardeman county, Tenn.

Venus—Continued.— **sublamellosus** n. s. Shumard. (1859.)

Trans. Acad. Sci., St. Louis, vol. 1, 1856-1860. pp. 598, 599. St. Louis, 1856-1860. B. F. Shumard.

Formation: Cretaceous.

Location: Grayson county, five miles north of Sherman, Tex.

— **tetrahedra** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 163, pl. 30, fig. 247. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez, Cal.

— **veatchii** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 162, pl. 23, fig. 142. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Cal.

— (**Mercenaria** ?) **varians** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 161, 162, pl. 23, figs. 140, 140a, 141. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Near Martinez; Pence's ranch, Butte county; Tuscan springs, Tehama county, Cal.

— (**Linn.**) **Morton**. (1829.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 122. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: Big Timber creek, Gloucester county, N. J.

— ? (**Linn.**) **Morton**. (1830.)

Am. Jour. Sci., 1st ser., vol. 17, p. 286. New Haven, 1830. S. G. Morton.

Formation: Ferruginous sand [Cretaceous].

Location:

— ? **sp. undet.** Roemer. (1849.)

Texas, p. 407. Bonn, 1849. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

— (?) **sp. undet.** Roemer. (1852.)

Kreide. von Tex., p. 47. Bonn, 1852. F. Roemer.

Formation: Cretaceous.

Location: Fredericksburg, Tex.

Vermetus (Sow.) Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 197. Phila., 1827-1831. S. G. Morton.

— **rotula** n. s. Morton. (1830.)

Jour. Acad. Nat. Sci., Phila., vol. 6, 1st ser., 1827-1831, p. 197. Phila., 1827-1831. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

— **rotula** Morton. (1830.)

Am. Jour. Sci., 1st ser., vol. 18, pl. 3, fig. 18. New Haven, 1830. S. G. Morton.

— **rotula** Morton. (1834.)

Synop. Org. Rem. Cret. Gr. U. S., pp. 81, 82, pl. 1, fig. 14. Phila., 1834. S. G. Morton.

Formation: Cretaceous.

Location: New Jersey.

Vermetus—Continued.

- (**Serpula**) sp. undet. Hill. (1889.)
Geol. Sur. Texas, Bull. No. 4, p. 17. Austin, 1889.
R. T. Hill.

Formation: Cretaceous.

Location: Texas.

- Vetericardia** (Con.) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, p. 127. Wash., 1885.
R. P. Whitfield.

- **crenulirata** (Lea) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 128, 129, pl. 18,
figs. 5-7 Wash., 1885. R. P. Whitfield.

Formation: Cretaceous.

Location: Haddonfield, N. J.

- **octolirata** (Gabb) Whitfield. (1885.)
Mon. U. S. Geol. Sur., vol. 9, pp. 127, 128. Wash.,
1885. R. P. Whitfield.

Formation: Cretaceous.

Location: New Jersey?

Vetocardia n. g. Conrad. (1868.)

- Am. Jour. Conch., vol. 4, pp. 246, 247. Phila.,
1868. T. A. Conrad.

- **crenalirata** Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p.
43, pl. 1, fig. 23. Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Location: Haddonfield, N. J.

- **crenalirata** Conrad. (1869.)
Am. Jour. Conch., vol. 5, Phila., 1869, 1870, p. 48.
Phila., 1870. T. A. Conrad.

Formation: Cretaceous.

Vitrina (Drapernaud) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 544, 545.
Wash., 1876. F. B. Meek.

- **obliqua n. s. M. & H.** (1857.)
Proc. Acad. Nat. Sci., Phila., for 1858, p. 134.
Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Mouth of Judith river, Nebr.

- **obliqua** (M. & H.) Meek. (1876.)
Rep. U. S. Geol. Sur. Terr., vol. 9, p. 545, pl. 42,
figs. 10a, b. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Mouth of Judith river.

- ? **obliqua** (M. & H.) White. (1883.)
Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 87. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

- **obliqua** (M. & H.) White. (1883.)
Third Ann. Rep. U. S. Geol. Sur., p. 452, pl. 27,
figs. 32, 33. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Vivipara cossatotensis n. s. Hill. (1888.)

- Ann. Rep. Geol. Sur. Ark., for 1888, vol. 2, p. 130,
pl. 3, figs 4, 4a, 5, 5a. Little Rock, 1888. R.
T. Hill.

Formation: Cretaceous?

Location: Well near Chapel hill, Sevier county,
Ark.

Viviparus (Montfort) M. & H. (1865.)

- Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 114, 115. Wash., 1865.
Meek & Hayden.

- **conradi** (M. & H.) Meek. (1876.)

- Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 597, 580,
pl. 42, figs. 15a-d. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Mouth of Judith river, Mont.

- **conradi** (M. & H.) Meek. (1877.)

- Rep. Geol. Expl., Fortieth Parallel, vol. 4, pt. 1,
pp. 178, 179, pl. 17, figs. 18, 18a. Wash., 1877.
F. B. Meek.

Formation: Cretaceous.

Location: Mouth of Sulphur creek, on Bear river,
Wyo.

- **conradi** (M. & H.) White. (1880.)

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Mouth of Judith river, Mont.

- **conradi** (M. & H.) White. (1883.)

- Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24,
figs. 4-6. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

- **conradi** (M. & H.) Whiteaves. (1885.)

- Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 76. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, six miles below
the mouth of the Bow river; south side of Milk
river, one mile above the mouth of Pā-kow-ki
coulée; South Saskatchewan, one mile below
the mouth of the Bow river, Canada.

- **couesi n. s. White.** (1878.)

- Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No.
3, pp. 717, 718. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Valley of Bear river, seven miles north-
westward from Evanston, Wyo., and at several
points in the vicinity of Mellis station, Union
Pacific railroad, near the confluence of Sulphur
creek and Bear river.

- **cousei** White. (1879.)

- Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 245. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear river valley, Wyo.

- **couesi** White. (1880.)

- Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 99, pl. 30, fig. 1a. Wash., 1880.
C. A. White.

Formation: Cretaceous.

Location: Valley of Bear river, seven miles north-
ward from Evanston, Wyo., and also near the
mouth of Sulphur creek, above Evanston.

- **couesii** White. (1883.)

- Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 8, fig.
1. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southwestern Wyoming and adjacent
parts of Utah.

Viviparus—Continued.— **gilli n. s. M. & H. (1865.)**

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, p. 115, pl. 5, figs. 3, *a*, *b*.
Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of Black hills.

— **gilli (M. & H.) White. (1886.)**

Bull. U. S. Geol. Sur., No. 29, p. 23, pl. 4, fig. 17.
Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Black hills of Dakota.

— **gillianus (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 466, pl. 3, fig.
8. Wash., 1883. C. A. White.

Formation: Jurassic.

Location: Near the Black hills.

— **leai (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 577, 578, pl.
44, figs. 6*a-d*. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Three miles below Fort Clarke, [N.]
Dak.

— **leai (M. & H.) White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **leai (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 27,
figs. 10-14. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Crow creek valley, east of the Rocky
mountains, in Colorado.

— **leai (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 24. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Bow river, four miles west of Blackfoot
crossing; St. Mary river, at Gooseberry canyon,
and three miles north of the forty-ninth parallel;
Old Man river, two miles above Rye-grass flat;
Belly river, twenty-three miles above the mouth
of the Waterton; Pincher creek; Blind Man
river, near fifth principal meridian, Canada.

— **leai (M. & H.) Whiteaves. (1885.)**

Geol. and Nat. Hist. Sur. Can., Cont. Can. Pale-
ont., vol. 1, pt. 1, p. 28. Montreal, 1885. J. F.
Whiteaves.

Formation: Cretaceous.

Location: Souris river, four miles east of Roche
Percée; Short creek, Souris river, Canada.

— **leidy (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 582, 583,
pl. 44, fig. 4. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Ten miles below Fort Union, Dak., and
near the mouth of Powder river, on the Yellow-
stone, in Montana.

— **leidy (M. & H.) White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Viviparus—Continued.— **leidy (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24, fig.
7. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **leidy var. formosus n. var. Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 583, pl. 44,
figs. 3*a*, *b*. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Ten miles below Fort Union, Dak., and
near the mouth of Powder river, on the Yellow-
stone, in Montana.

— **leidy var. formosus (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24,
figs. 8, 9. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **panguitchensis n. s. White. (1876.)**

Rep. Geol. Uinta Mts., pp. 123, 124. Wash., 1876.
C. A. White.

Formation: Cretaceous.

Location: [Southern Utah.]

— **panguitchensis White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 25,
figs. 19-21. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Southern Utah.

— **peculiaris (M. & H.) Meek. (1876.)**

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 580, fig. 79.
Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Fort Clarke, [N.] Dak.

— **peculiaris (M. & H.) White. (1880.)**

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri region.

— **peculiaris (M. & H.) White. (1883.)**

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24,
figs. 23, 24. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **plicapressus n. s. White. (1876.)**

Rep. Geol. Uinta Mts., p. 133. Wash., 1876. C. A.
White.

Formation: Tertiary [Cretaceous].

Location: Black buttes, Wyo.

— **plicapressus White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pp. 209, 210. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Canyon park, Colo.

— **plicapressus White. (1879.)**

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 221. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo., and Yampa
valley, near Canyon park, Colo.

Viviparus—Continued.— **plicapressus** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 98, pl. 28, figs. 3a, b. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Black Buttes station, Wyo.

— **plicapressus** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24, figs. 25, 26. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **prudential** n. s. White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4, No. 3, pp. 716, 717. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Crow creek, Colo., ten miles above its confluence with South Platte river, northern Colorado.

— **prudential** White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 172. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colo.

— **prudential** White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 98, 99, pl. 28, figs. 5ab. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Valley of Crow creek, ten miles above the confluence of that creek with Platte river, northern Colorado.

— **prudential** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 25, figs. 17-18. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **prudential** (White) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 24. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Gooseberry canyon, St. Mary river, Pincher creek, Canada.

— **reynoldsianus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 584, 585, pl. 44, figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: [Cretaceous.]

Location: Clear fork of Powder river, Mont., lower fork of same stream.

— **retusus** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 578, 579, pl. 44, figs. 5a-f. Wash., 1876. F. B. Meek.

Formation: [Cretaceous.]

Location: Three miles below Fort Clarke, [N.] Dak.

— **retusus** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

Viviparus—Continued.— **retusus** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24, figs. 1-3. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: [Three miles below Fort Clarke, [N.] Dak.]

— **reynoldsianus** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **reynoldsianus** White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 25, figs. 22, 23. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **trochiformis** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 580-582, pl. 44, figs. 2a-e. Wash., 1876. F. B. Meek.

Formation: [Cretaceous].

Location: Ten miles below Fort Union, Mont.; also one hundred and fifty miles below Fort Union.

— **trochiformis** (M. & H.) White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, p. 100. Wash., 1880. C. A. White.

Formation: Cretaceous.

Location: Upper Missouri river region.

— **trochiformis** (M. & H.) White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 467, pl. 24, figs. 10-16. Wash., 1883. C. A. White.

Formation: Cretaceous.

— **trochiformis** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 28. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Souris river, four miles east of Roche Percée and Great Valley, about one hundred miles west of Wood End depot, on the forty-ninth parallel, Canada.

Voltsella (Scopoli) M. & H. (1865.)

Paleont. Up. Missouri, Smithsonian. Cont. Knowl., vol. 14, No. 172, pp. 85, 86. Wash., 1865. Meek & Hayden.

— (Scopoli) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 70. Wash., 1876. F. B. Meek.

— **attenuata** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 74, pl. 28, figs. 8a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river.

Volsella—Continued.— **formosa** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, pp. 86, 87, figs. A and B text.
Wash., 1865. Meek & Hayden.

Formation: Jurassic.

Location: Big Horn mountains, Dak.

— **galpiniana** (E. & S.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 73, pl. 28,
figs. 7a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Long lake, and on Moreau river.

— **meekii** (E. & S.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 72, pl. 15,
figs. 3a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: On the Yellowstone river.

— **pertenuis** M. & H. (1865.)

Paleont. Up. Missouri, Smithson. Cont. Knowl.,
vol. 14, No. 172, p. 86, pl. 3, figs. 5, 5a. Wash.,
1865. Meek & Hayden.

Formation: Jurassic.

Location: Southwest base of the Black hills.

— **pertenuis** (M. & H.) Whitfield.
(1880.)

Rep. Geol. Black Hills of Dak., pp. 362, 363, pl.
5, figs. 13, 14. Wash., 1880. R. P. Whitfield.

Formation: Jurassic.

Location: East side of Spearfish creek, near its
junction with the Redwater, Black hills.

— **scalprum** var. **isonema** n. var.
Meek. (1877.)

Rep. Geol. Expl. Fortieth Parallel, vol. 4, pt. 1,
pp. 132, 133, pl. 12, figs. 4, 4a. Wash., 1877.
F. B. Meek.

Formation: Jurassic.

Location: Weber canyon, Wasatch range, Utah.

— **subimbricata** (Meek) White.
(1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, pp. 145, 146, pl. 37, figs. 2a-c.
Wash., 1880. C. A. White.

Formation: Jurassic.

Location: Near the lower canyon of the Yellow-
stone river and at Spring canyon, in Montana,
and near Vermillion canyon, northwestern Colo-
rado.

— (**Brachydontes**) **laticostata** n. s.
White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, p. 708. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, near White River Indian
agency, Colorado.

— (**Brachydontes**) **laticostata** White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.,
Terr., p. 212. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colo.

Volsella—Continued.— (**Brachydontes**) **laticostata** White.
(1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., pt. 1, p. 59, pl. 25, fig. 4a. Wash., 1880.
C. A. White.

Formation: Cretaceous.

Location: Danforth hills, near White River Indian
agency, northwestern Colorado.

— (**Brachydontes**) **laticostata** White.
(1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 423, pl. 13,
fig. 2. Wash., 1883. C. A. White.

Formation: Cretaceous.

Location: Wyoming and Colorado.

— (**Brachydontes**) **multilinigera**
(Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 249. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Hilliard station, Wyo.

— (**Brachydontes**) **multilinigera**
(Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 248. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Bear River valley, Wyo.

— (**Brachydontes**) **multilinigera**
(Meek) White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 235. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Coalville, Utah.

— (**Brachydontes**) **regularis** n. s.
White. (1878.)

Bull. U. S. Geol. and Geogr. Sur. Terr., vol. 4,
No. 3, pp. 707, 708. Wash., 1878. C. A. White.

Formation: Cretaceous.

Location: The type specimen is from the valley of
Crow creek, northern Colorado, fifteen miles
above the confluence of that creek with South
Platte river. Other examples are from Canyon
park, valley of Yampa river; Danforth hills,
near White River Indian agency; and Rock
Springs station, Union Pacific railroad, Wyo.

— (**Brachydontes**) **regularis** White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 168. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Crow Creek valley, Colo.

— (**Brachydontes**) **regularis** White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 208. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Yampa valley, near Canyon park, Colo.

— (**Brachydontes**) **regularis** White.
(1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur.
Terr., p. 212. Wash., 1879. C. A. White.

Formation: Cretaceous.

Location: Danforth hills, Colo.

VolSELLA—Continued.— (**Brachydontes**) *regularis* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 215. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Rock springs, Wyo.

— (**Brachydontes**) *regularis* White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 218. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Rock springs, Wyo.; Crow Creek valley.

— (**Brachydontes**) *regularis* White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 58, 59, pl. 25, figs. 3a. Wash., 1880. C. A. White.
Formation: Cretaceous.
Location: Valley of Crow creek, northern Colorado, about fifteen miles above the confluence of that creek with Platte river. Other examples are from Canyon park, valley of Yampa river; Danforth hills, near White River Indian agency, northwestern Colorado; and Rock Springs station, Union Pacific railroad, in the valley of Better creek, Wyo.

— (**Brachydontes**) *regularis* White. (1883.)

Third Ann. Rep. U. S. Geol. Sur., p. 423, pl. 13, fig. 1. Wash., 1883. C. A. White.
Formation: Cretaceous.
Location: Wyoming and Colorado.

— (**Modiola**) *formosa* (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., pp. 361, 362, pl. 5, fig. 15. Wash., 1880. R. P. Whitfield.
Formation: Jurassic.
Location: Near Big Horn mountains.

— (**Modiolina**) *platynota* n. s. White. (1880.)

Twelfth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., pt. 1, pp. 146, 147, pl. 37, figs. 3a, b. Wash., 1880. C. A. White.
Formation: Jurassic.
Location: Head of Lincoln valley, southeastern Idaho.

— sp. undet. White. (1879.)

Eleventh Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 242. Wash., 1879. C. A. White.
Formation: Cretaceous.
Location: Bear River valley, Wyo.

Voluta (Linn) Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 322. Phila., 1862. W. M. Gabb.

— *cancellata* n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 169. Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: Noxubie county, Mississippi.

Voluta—Continued.— (**Fasciolaria**?) *delawarensis* n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, pp. 322, 323. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Delaware and Chesapeake canal.

— *fusiformis* n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 169. Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: [Mississippi or Alabama?]

— *jugosa* n. s. Tuomey. (1854.)

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 169. Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: Noxubie county, Mississippi.

— *kanei* n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 323. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: New Jersey.

— *mucronata* n. s. Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 323. Phila., 1862. W. M. Gabb.
Formation: Cretaceous.
Location: Crosswicks, N. J.

— *spillmanii* n. s. Tuomey.

Proc. Acad. Nat. Sci., Phila., vol. 7, p. 169. Phila., 1856. M. Tuomey.
Formation: Cretaceous.
Location: Columbus, Mississippi.

— sp. undet. Forbes. (1844.)

Quart. Jour. Geol. Soc., London, vol. 1, p. 63, figs. a-c. London, 1845. Edward Forbes.
Formation: Cretaceous.
Location: New Jersey.

— sp. undet. Credner. (1870.)

Zeitsch. Deutsch. Geol. Ges., Band 22, p. 237. Berlin, 1870. H. Credner.
Formation: Cretaceous.
Location: New Jersey.

Volutat[1]ithes (Swains.) Conrad. (1855.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean; App. Prelim. Geol. Rep. of W. P. Blake, Pl. p. 11. Wash., 1855. T. A. Conrad.

— *[1]ithes californiana* n. s. Conrad. (1855.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean; App. Prelim. Geol. Rep. of W. P. Blake, Pl. p. 11. Wash., 1855. T. A. Conrad.
Formation: Eocene [Cretaceous].
Location: Cañada de las Uvas.

— *[1]ithes californiana* Conrad. (1856.)

Rep. Expl. and Sur. R. R. R. Miss. River to Pacific Ocean, vol. 5; App. p. 322, pl. 2, fig. 9. Wash., 1856. T. A. Conrad.
Formation: Eocene [Cretaceous].
Location: Cañada de las Uvas.

Volutilithes (Swainson) Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333. Phila., 1855-1858. T. A. Conrad.

—abbotti n. s. Gabb. (1860.)

Proc. Acad. Nat. Sci., Phila., for 1860, p. 94, pl. 2, fig. 7. Phila., 1861. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

—bella n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 300, pl. 48 fig. 7. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Delaware and Chesapeake canal.

—biplicata n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 300, pl. 48, fig. 6. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Burlington county, N. J.

—conradi n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 300, 301, pl. 48, fig. 10. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Crosswicks, N. J.

—conradi Gabb. (1861.)

Proc. Acad. Nat. Sci., Phila., for 1861, p. 364. Phila., 1862. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

—cretacea n. s. Conrad. (1858.)

Jour. Acad. Nat. Sci., Phila., vol. 3, 2d ser., 1855-1858, p. 333, pl. 35, fig. 16. Phila., 1855-1858. T. A. Conrad.

Formation: Cretaceous.

Location: Owl creek, three miles north of the town of Ripley, Miss.

—eufaulensis n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, pp. 286, 287, pl. 47, fig. 18. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Eufaula, Ala.

—nasuta n. s. Gabb. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser., 1858-1860, p. 300, pl. 48, fig. 9. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Monmouth county, N. J.

—navarroensis n. s. Shumard. (1861.)

Proc. Boston Soc. Nat. Hist., vol. 8, 1861, 1862, p. 192. Boston, 1862. B. F. Shumard.

Formation: Cretaceous.

Location: Near Corsicana, Navarro county, Tex.

—navarroensis (Shum.) Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 102, 103, pl. 19, fig. 56. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Tuscan springs, Pence's ranch, above Oroville, Butte county; Jacksonville, Oregon; Siskiyou mountains; Chico creek; Cow creek, Shasta county, Cal.

Volutilithes—Continued.**—saffordi n. s. Gabb. (1860.)**

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-1860, p. 300, pl. 48, fig. 8. Phila., 1858-1860. W. M. Gabb.

Formation: Cretaceous.

Location: Tennessee.

—(Athleta) leioderma n. s. Conrad. (1860.)

Jour. Acad. Nat. Sci., Phila., vol. 4, 2d ser. 1858-1860, p. 292, pl. 46, fig. 32. Phila., 1858-1860. T. A. Conrad.

Formation: Cretaceous.

Location: Tippah county, Miss.

Volutoderma n. g. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 289. Phila., 1876. W. M. Gabb.

—? biplicata Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 292. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

—sp. undet. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 292. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: Vincentown, N. J.

Vutomorpha n. g. Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 290. Phila., 1876. W. M. Gabb.

—(Gabb) Dall. (1890.)

Trans. Wag. Free. Inst. Sci., Phila., vol. 3, p. 73. Phila., 1890. W. H. Dall.

—abbotti Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 293. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

—bella Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 293. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

—conradi Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 293. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Location: New Jersey.

—conradi (Gabb) Dall. (1890.)

Trans. Wag. Free. Inst. Sci., Phila., vol. 3, p. 73. Phila., 1890. W. H. Dall.

Formation: Cretaceous.

Location: New Jersey.

—kanei Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 293. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

—mucronata Gabb. (1876.)

Proc. Acad. Nat. Sci., Phila., for 1876, p. 293. Phila., 1876. W. M. Gabb.

Formation: Cretaceous.

Volutomorpha—Continued.

- **saffordi** Gabb. (1876.)
Proc. Acad. Nat. Sci., Phila., for 1876, p. 293.
Phila., 1876. W. M. Gabb.
Formation: Cretaceous.

Volviceramus (subgen. *Stoliczka*) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 40. Wash., 1876. F. B. Meek.

- **exogyroides** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 84. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South branch of Drywood fork, Waterton river; entrance to North Kootanie pass, Canada.

Vorticifex (Meek) White. (1886.)

Bull. U. S. Geol. Sur., No. 29, p. 21. Wash., 1886. C. A. White.

- **stearnsii** n. s. White. (1886.)

Bull. U. S. Geol. Sur., No. 29, pp. 21, 22, pl. 4, figs. 4-7. Wash., 1886. C. A. White.

Formation: Jurassic.

Location: Como, Wyo.

Websteria (Edwards & Haime) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 2, 3. Wash., 1876. F. B. Meek.

- **cretacea** n. s. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, pp. 3, 4, pl. 28, figs. 3a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: South branch of Cheyenne river, near Black hills.

Whitneya n. g. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, pp. 103, 104. Phila., 1864. W. M. Gabb.

- **ficus** n. s. Gabb. (1864.)

Geol. Sur. Cal. Paleont., vol. 1, p. 104, pl. 28, fig. 216. Phila., 1864. W. M. Gabb.

Formation: Cretaceous.

Location: Fort Tejon, Cal.

Xylophaga elegantula n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, p. 141. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Muscle Shell river, Nebr.

- **stimpsoni** n. s. M. & H. (1857.)

Proc. Acad. Nat. Sci., Phila., for 1857, pp. 141, 142. Phila., 1858. Meek & Hayden.

Formation: Cretaceous.

Location: Muscle Shell river, Nebr.

Xylophagella n. g. Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur., Smithson. Misc. Coll., vol. 7, No. 177, p. 34. Wash., 1864. F. B. Meek.

- subgen. Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 255. Wash., 1876. F. B. Meek.

Xylophagella—Continued.

- **elegantula** (M. & H.) Meek. (1864.)

Check List Invert. Foss. N. Am. Cret. and Jur.

Smithson. Misc. Coll., vol. 7, No. 177, p. 34.

Wash., 1864. F. B. Meek.

Formation: Cretaceous.

Location: Dakota.

- Yoldia** (Mörch.) Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 8. Phila., 1867. T. A. Conrad.

- (Möller) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 107. Wash., 1876. F. B. Meek.

- **albaria** n. s. Conrad. (1867.)

Am. Jour. Conch., vol. 3, p. 8. Phila., 1867. T. A. Conrad.

Formation: Cretaceous.

- **arata** n. s. Whiteaves. (1884.)

Geol. and Nat. Hist. Sur. Can., Mes. Foss., vol. 1, pt. 3, p. 233, pl. 31, figs. 4, 4a. Montreal, 1884. J. F. Whiteaves.

Formation: Cretaceous.

Location: South island, Skidegate inlet; Bear Skin bay, Skidegate inlet; Cumshewa inlet.

- **arata** Whiteaves. (1887.)

Geol. and Nat. Hist. Sur. Can., vol. 2, n. ser., 1886, App. I, p. 112 B. Montreal, 1887. J. F. Whiteaves.

Formation: Cretaceous.

Location: East side of Winter harbor, Forward inlet.

- **arata** Whiteaves. (1889.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 2, p. 154. Montreal, 1889. J. F. Whiteaves.

Formation: Cretaceous.

Location: East side of Winter harbor, Forward inlet, Canada.

- **eufalensis** (Gabb) Conrad. (1870.)

Am. Jour. Conch., vol. 6, Phila., 1870, 1871, p. 74. Phila., 1871. T. A. Conrad.

Formation: Cretaceous.

- **evansi** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 111, pl. 28, figs. 10a-c. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river; on the Yellowstone river; also on Milk river.

- **evansi** (M. & H.) Whitfield. (1880.)

Rep. Geol. Black Hills of Dak., p. 409, pl. 11, figs. 1, 2. Wash., 1880. R. P. Whitfield.

Formation: Cretaceous.

Location: On Old Woman fork of the Cheyenne river, and near Rapid creek, Black hills.

- **evansi** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 38. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: South Saskatchewan, fifteen miles west of the mouth of Swift Current creek; Old Wives creek, township 10, range 11, west of third principal meridian, Canada.

Yoldia—Continued.— **microdonta** n. s. Meek. (1871.)

Fourth Ann. Rep. U. S. Geol. and Geogr. Sur. Terr., p. 304. Wash., 1871. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **microdonta** Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 109, pl. 2, fig. 2. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Twelve miles southwest of Salina, Kans.

— **scitula** (M. & H.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 110, pl. 28, fig. 9. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: Moreau river and Long lake.

— **scitula** (M. & H.) Whiteaves. (1885.)

Geol. and Nat. Hist. Sur. Can., Cont. Can. Paleont., vol. 1, pt. 1, p. 38, pl. 5, fig. 2. Montreal, 1885. J. F. Whiteaves.

Formation: Cretaceous.

Location: Twelve miles east of White Mud river, on trail to Woody mountain, and forty-ninth parallel, on the east branch of the Poplar river, Canada.

— **striatula** (Forbes) Whiteaves. (1879.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 2, p. 162, pl. 18, fig. 9. Montreal, 1879. J. F. Whiteaves.

Formation: Cretaceous.

Location: Northwest side of Hornby island; southwest side of Denman island; Sucia islands.

Yoldia—Continued.— **ventricosa** (H. & M.) Meek. (1876.)

Rep. U. S. Geol. Sur. Terr., vol. 9, p. 112, pl. 15, figs. 5a, b. Wash., 1876. F. B. Meek.

Formation: Cretaceous.

Location: South fork of Cheyenne, river.

— **sp. undet. Whiteaves.** (1876.)

Geol. Sur. Can., Mes. Foss., vol. 1, pt. 1, pp. 72, 73. Montreal, 1876. J. F. Whiteaves.

Formation: Cretaceous.

Location: Queen Charlotte islands.

— **sp. undet. Whiteaves.** (1878.)

Canadian Naturalist, vol. 8, n. ser., No. 7, pp. 404, 405. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river.

— **sp. undet. Whiteaves.** (1882.)

Proc. and Trans. Roy. Soc., Canada, vol. 1, sec. 4, p. 85. Montreal, 1883. J. F. Whiteaves.

Formation: Cretaceous.

Location: Skagit river, Canada.

— (or **Corbis**) **sp. undet. Whiteaves.** (1878.)

Geol. Sur. Can., Rep. Prog. for 1876, 1877, p. 154. Montreal, 1878. J. F. Whiteaves.

Formation: Jurassic.

Location: Iltasyouco river, British Columbia.

Zirphæa (Leach) White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 15. Wash., 1889. C. A. White.

— **plana** n. s. White. (1889.)

Bull. U. S. Geol. Sur., No. 51, p. 15, pl. 4, fig. 22. Wash., 1889. C. A. White.

Formation: Cretaceous.

Location: Martinez, Contra Costa county, Cal.

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[UNITED STATES. *Department of the interior. (U. S. geological survey).*
Bulletin 103.]

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UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

HIGH TEMPERATURE WORK

IN

IGNEOUS FUSION AND EBULLITION

CHIEFLY IN RELATION TO PRESSURE

BY

CARL BARUS



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CONTENTS.

	Page
Preface.....	9
CHAPTER I. The pressure variations of certain high temperature (metallic) boiling points.....	11
Introductory.....	11
The plan pursued	11
The pyrometer.....	12
Apparatus	12
Low boiling points.....	12
High boiling points.....	13
Torsion galvanometer.....	14
Cold junction.....	16
Observations	16
Mercury	16
Sulphur	18
Zinc	19
Cadmium.....	19
Bismuth	20
Remarks.....	21
Inferences	21
Available equations.....	21
Constants computed	22
Graphic representation.....	23
Conclusion.....	23
CHAPTER II. The contraction of molten igneous rock on passing from liquid to solid	25
Introductory.....	25
The rock.....	25
Literature	25
Effect of fusion (polymerism).....	25
Apparatus	27
Temperature measurement	27
General disposition of apparatus	28
Furnace	29
Fusion tube	30
Thermocouples.....	30
Sight tubes	31
Vertical micrometer.....	31
Telephonic registration	32
Method of measurement.....	33
Consecutive adjustments.....	33
Computation.....	34
Errors	35

CHAPTER II—Continued.

	Page.
Results	37
Arrangement of the tables	37
Contraction of diabase. Tables	37
Contraction of diabase. Tables and chart	39
Contraction of diabase. Tables and chart	40
General remarks	41
Fusion and solidification alternating	42
Inferences	43
Comparison with thymol	43
Lower critical temperature	43
Melting point and pressure	44
CHAPTER III. The thermal capacity of igneous rock, considered in its bearing on melting point and pressure	45
Preliminary remarks	45
Introductory	45
Literature	45
Apparatus	46
The rock to be tested	46
Thermal capacity of platinum	46
Furnace	46
Temperature	47
Calorimeter	48
Results	48
Method of work	48
Arrangement of the tables	49
Tables	49
Inferences	53
Digest and charts	53
Specific heat	54
Hysteresis	54
Latent heat	54
The relation of melting point to pressure	55

ILLUSTRATIONS.

	Page.
PLATE I. Boiling tube and appurtenances for low temperature.....	12
II. Torsion galvanometer for thermoelectric pyrometry	14
III. Chart showing the change of boiling point with pressure (centimeters of mercury) for water, mercury, sulphur, cadmium, zinc, and bismuth	24
IV. Furnace for measuring volume contraction of molten rock.....	30
V. Contraction of molten diabase, continuously from liquid to solid...	40
VI. Contraction of molten diabase, continuously from liquid to solid.....	42
VII. Furnace for calorimetry, with the body (crucible), the pyrometer and the holders in place	46
VIII. Relation of thermal capacity (solid and liquid) to temperature (°C.).	52
IX. Relation of thermal capacity (solid and liquid) to temperature (°C.).	54
FIG. 1. Boiling crucible for high temperatures.....	12
2. Furnace with crucible in place	13
3. Cyclic volume changes produced by alternate fusion and solidification of rock magma (diabase).....	43

ILLUSTRATIONS.

1. The first illustration, showing the general appearance of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	1
2. The second illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	2
3. The third illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	3
4. The fourth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	4
5. The fifth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	5
6. The sixth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	6
7. The seventh illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	7
8. The eighth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	8
9. The ninth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	9
10. The tenth illustration, showing the interior of the building, and the position of the entrance, is taken from the north-east corner, looking towards the south-west.	10

PREFACE.

In the following bulletin I have brought together the more important results of experiments in high temperatures, made since the publication of my bulletin on the thermoelectric measurement of high temperatures.¹ Chapter I, in addition to pointing out certain inherent relations between metallic vapor tensions, has a direct bearing on pyrometry. Chapters II and III are of geological importance, and the work was done for Mr. Clarence King. Chapter II shows that in case of the igneous fusion of basic magma, the passage from liquid to solid is one of contraction, and measures the difference of specific volumes at the solidifying temperature. Chapter III contains a full account of the thermal capacity of the same rock under the same conditions, and by aid of Chapter II leads to a numerical value for the relation of melting point to pressure, for silicates.

CARL BARUS.

JUNE 8, 1892.

¹Bull. U. S. Geol. Survey, No. 54, 1889, p. 313.

HIGH TEMPERATURE WORK IN IGNEOUS FUSION AND EBULLITION, CHIEFLY IN RELATION TO PRESSURE.

BY CARL BARUS.

CHAPTER I.

THE PRESSURE VARIATIONS OF CERTAIN HIGH TEMPERATURE (METALLIC) BOILING POINTS.¹

INTRODUCTORY.

1. *The plan pursued.*—In the following chapter² I describe a practical method for the calibration of thermocouples by aid of boiling points, and then apply it in measuring the vapor tensions of zinc, cadmium, and bismuth. During the course of the work a much neglected principle of Groshans³ is advantageously employed. I must state at the outset that it is not at all my object to furnish accurate values for boiling points. The purpose of this paper is to investigate the probable nature of the relation of boiling point to pressure, throughout very wide ranges of temperature, with the hope of stimulating speculation on the subject somewhat more rigorous than that of Groshans. It is clear that if a law can be found by which the normal (76 centimeters) boiling point of a substance can be predicted from an observed low-pressure boiling point, then there is hope of arriving at a more complete knowledge of high-temperature boiling points than is now available. More than this: By varying pressure, boiling points may be made to overlap each other. Hence a thermocouple calibrated as far as the boiling point of zinc for instance, may be used to measure the low-pressure boiling point of bismuth (say), and the couple then may be further calibrated by making use of the normal boiling point of bismuth at 76 centimeters, predicted by aid of the law in question. The process may obviously be repeated. The couple whose calibration interval has been enlarged in the manner given, may now be used to fix the low-pressure boiling point of some

¹The literature of the subject, which is very voluminous, may be omitted here because a full account is given in Bull. No. 54, pp. 1 to 30. At the present stage of progress of the kinetic theory of gases the air thermometer is still the only apparatus available for absolute high temperature measurement, and all data are directly or indirectly derived from it. An account of work of this kind is also given in the bulletin.

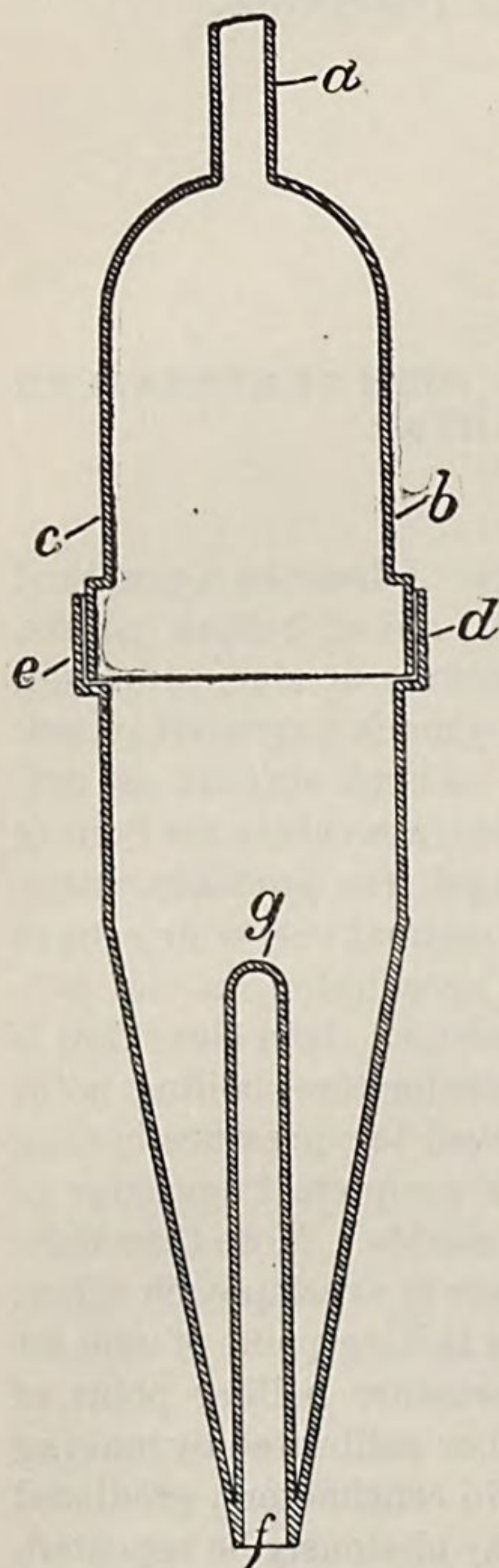
²Cf. Phil. Mag., (5), vol. 29, 1890, pp. 141-157.

³Groshans: Pogg. Ann., LXXVIII, p. 112, 1849.

other suitable metal, and then in turn be further calibrated by means of its boiling point. This is about the idea. It is not wholly illusory, as I think the present paper, which in spite of its approximate character contains considerable work, will show.

2. *The pyrometer.*—Let me say, too, that the platinum/platinum-iridium thermocouple used had on a former occasion¹ been tested for polymeri-

zation anomalies by minute comparison with the porcelain air thermometer,² and none were found. The alloy contained 20 percent of iridium. M. Le Chatelier³ unjustly rejects the platinum-iridium couple because of irregularities of the kind referred to. When the range of temperature is very large the Avenarius-Tait equation is found insufficient; but this equation subserves a good purpose when interpolation between two fixed temperature data, lying anywhere on the scale, but not very far apart, is called for.



APPARATUS.

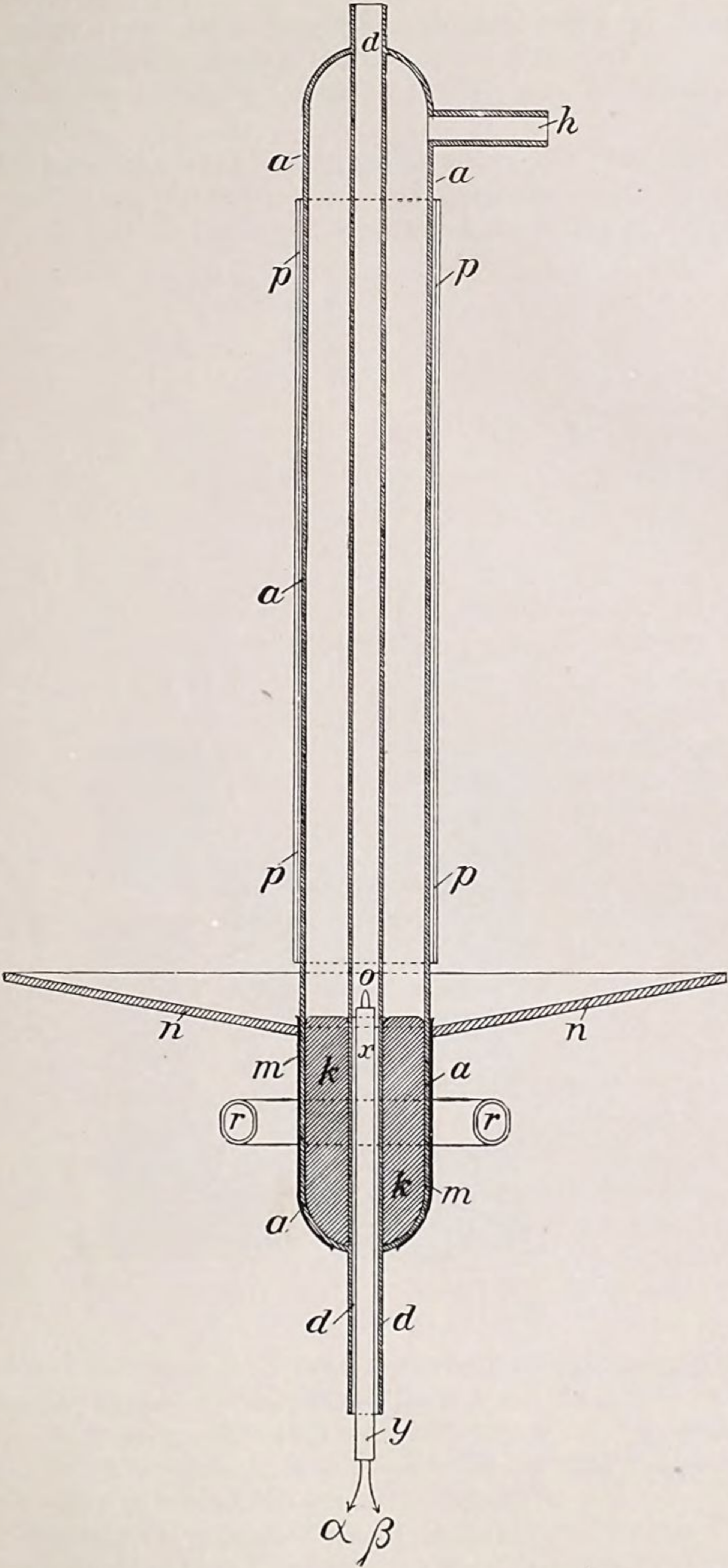
3. *Low boiling points.*—Boiling points below 500° may be studied in a closed glass tube *aa* (Pl. I), along the axis of which a thin-walled tube, *dd*, open at both ends, passes quite through. In the bottom of the annular space between the tubes the ebullition liquid, *kk*, is placed, and it is heated by the Gibbs' ring burner, *rr*. A funnel-shaped asbestos screen, *nn*, protects the upper tube against direct radiation. Other screens and jackets, *pp*, are suitably added. The upper end of the tube, *aa*, communicates with the air pump through the tubulure *h*. Finally, $\alpha \beta$, the thermocouple to be calibrated, consisting of platinum and platinum-iridium wire, is inserted into the bottom of the central tube, *dd*, with the junction *o* just above the plane of the ebullition liquid, *kk*. The upper part of the tube, *dd*, is closed with asbestos wicking (not shown), extending almost as far down as *o*.

The wires of the couple pass through parallel canals in a rod of fire clay, *xy*, and are thus well insulated. I may add that the boiling points

¹Barus: Bull. U. S. Geol. Survey, No. 54, Chapter IV.

²Unfortunately circumstances did not permit me to make use of the former air thermometer comparisons, nor was it expedient to repeat the work.

³Le Chatelier: Bull. Soc. Chimique Paris, Vol. 45, 1886, p. 482. Cf. Phil. Mag., (5) vol. 34, 1892, p. 376.



BOILING TUBE AND APPURTENANCES FOR LOW TEMPERATURES. SCALE $\frac{1}{2}$.

of mercury, sulphur, etc., for all pressures compatible with the strength of tube are conveniently obtained in this way. The vacuum boiling point of cadmium is also easily reached. Boiling may be kept up for any length of time.

4. *High boiling points.*—For boiling points above 500° it is more convenient to use glazed porcelain or fire clay crucibles of the form efd , bdc , (Fig. 1). The ebullition liquid is shown at kk , in Fig. 2, and fg is

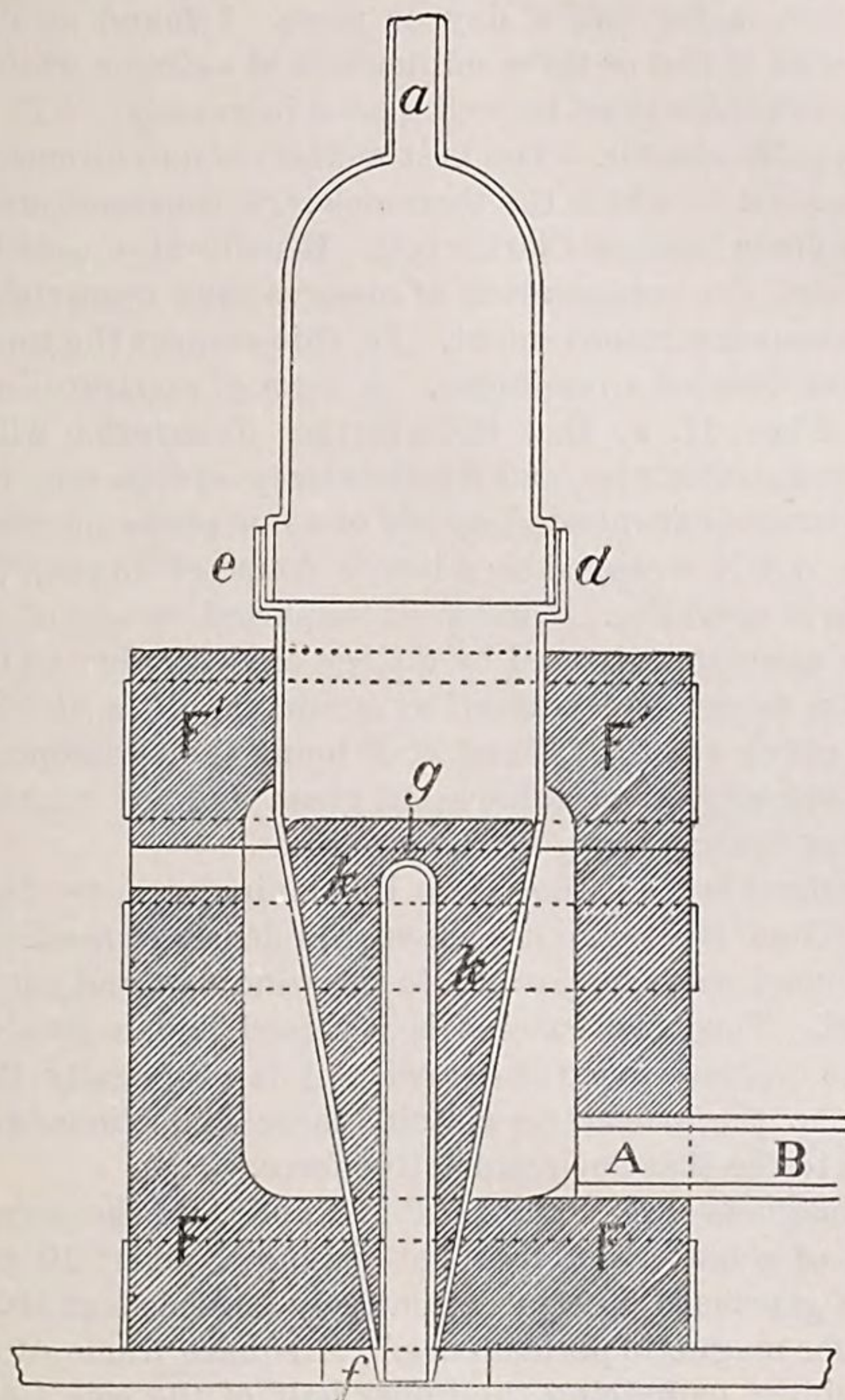


FIG. 2.—Furnace with crucible in place. Scale $\frac{1}{2}$.

the central tube in which the thermocouple, dd , is to be introduced. To vary the pressure under which boiling takes place the tube a is connected with an air pump. Finally, a tight joint at ed is secured by calking with asbestos wicking, and then filling up with fusible metal the annular space or trough left above the asbestos.

The crucible, efd , is surrounded by a small furnace of Fletcher's composition, $FFF'F'$, Fig. 2, and heated with one or more blast burners,

AB. If the flame impinges directly upon the cold crucible it is apt to break it; but such breakage may be quite prevented by surrounding the crucible with a conical shell of asbestos. Unfortunately, the crucibles can be used but once—unless the metal is cautiously poured out before solidifying, an operation which does not always succeed—for they are usually fractured by the solidifying metal, *kk*, on cooling. Nevertheless, the single experiment may be prolonged almost indefinitely; that is, for half a day or more. I found no difficulty in obtaining vacua of two or three millimeters at extreme white heat. In this case the crucibles must be well glazed internally. § 13.

5. *Torsion galvanometer.*—The best method of measurement is doubtless a null method, in which the thermoelectric constants are expressed in terms of a given Latimer Clark's cell. Recalibrations are then rarely necessary. But the computation of observations occurring in great numbers is somewhat inconvenient. In this respect the torsion galvanometer offers decided advantages. A form of apparatus of this kind is shown in Plate II, so that little further description will be necessary. *AA* is the coil of wire, and *BB* the astatic system seen in cross section. The system is suspended by aid of a fine platinum wire *EE*; and inasmuch as *AA* is wrapped on a heavy frame of copper, the motion of the needle is aperiodic. Torsion is imparted by aid of an alidade *DD*, and the amount registered by a large circle graduated in degrees. Fractions of a degree are read off by a mirror and scale adjustment, the parts of which are *C*, *MM* and *S*, *T* being the telescope.

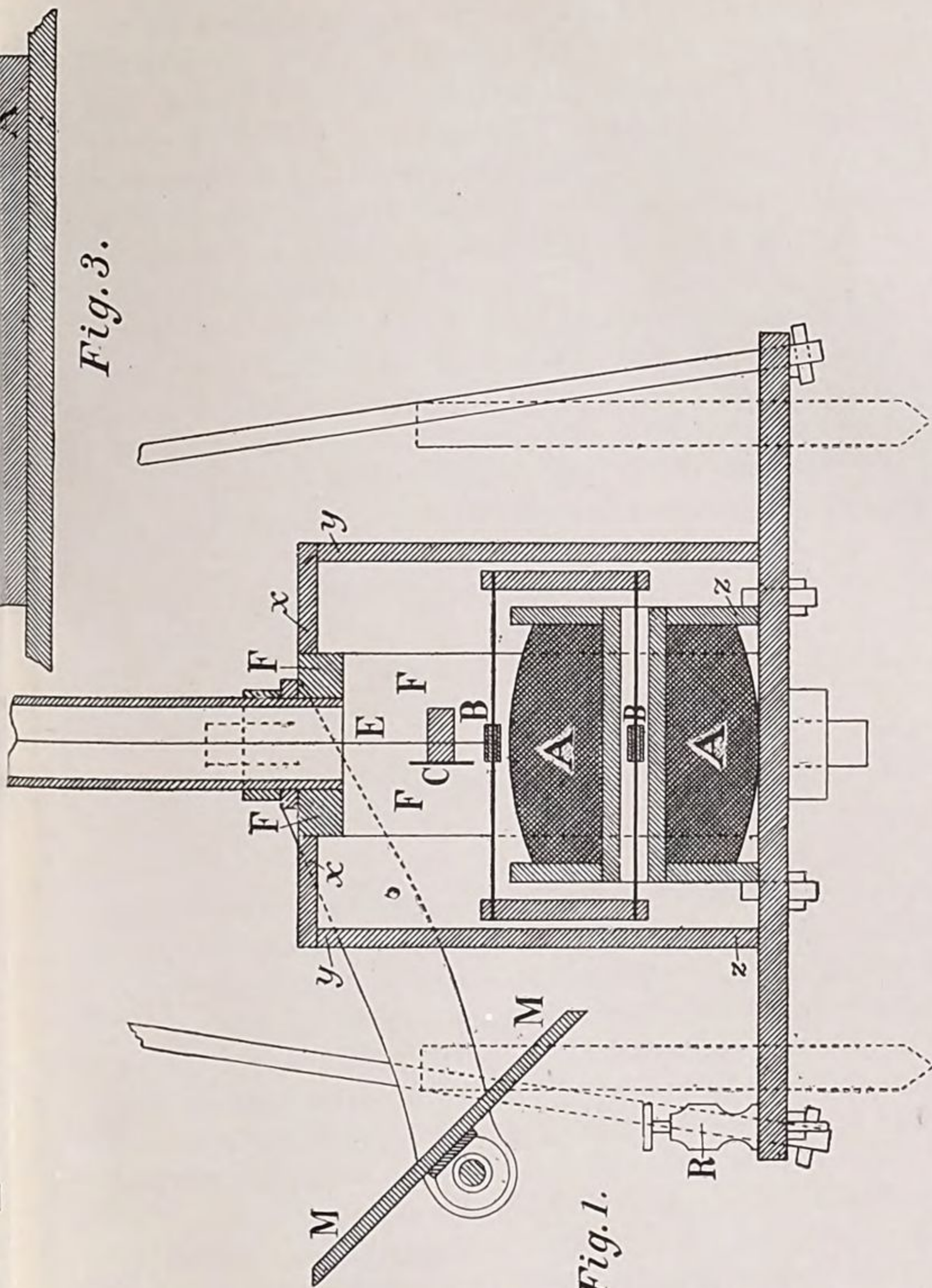
The scale proper *ss* is on transparent glass, and *S* a white diffuse reflector, so that the scale may be more distinct.

The instrument is high enough to be manipulated by the observer standing. When the current passes, the deflected needle is twisted back to a fiducial position, parallel to the windings, and the amount at once read off. Then the current is reversed and a similar reading made. Since the resistance of the coil *AA* is practically the only resistance of the thermoelectric circuit, these deflections are directly proportional to the thermoelectromotive force.

The two magnets *BB'* Plate II, Fig. 1 and 2, of the astatic system each consist of a battery of four flat magnets, about 10 centimeters long, and of glasshard steel, consecutively annealed at 100° both for temper and for magnetic permanence.¹ A square frame of aluminium and hard rubber, embracing the upper half of the coil *AA*, connects the magnets. To this the adjustable mirror is attached. The torsion fiber is a platinum wire, .018 centimeter in diameter. It therefore has considerable strength to resist wear and tear. Finally, the plate-glass doors *xyz*, which close the magnet box, are easily removable, so that the magnet and mirror are conveniently accessible.

The instrument has two zeros: the optical zero of the mirrors, relative to which the reflected scale readings are symmetrical, and the

¹Cf. Bull. U. S. Geol. Survey No. 14, 1885, p. 171. Cf. Chapter VI of the same bulletin.



TORSION GALVANOMETER FOR THERMOELECTRIC PYROMETRY. SCALE $\frac{1}{2}$.

magnetic zero of the astatic system, relative to which the deflections are symmetrical. The two fiducial marks should coincide. The magnetic zero is shown by the fact that the mean of the scale readings on commutation coincide with the zero reading for no current. In case of a system of needles very nearly astatic, the optic zero may be determined by plotting scale readings in terms of twist registered by the alidade without current, and noting the position of symmetry in the circumflexed curve of the chart.

6. It will be seen that by bringing the needle back to zero by twisting the fiber, the effect of the earth's local magnetic field is almost wholly eliminated in an adjusted instrument. For let u be the effective magnetic moment of the system and I the intensity of the current, τ the coefficient of torsion and φ the twist necessary to bring the needle back to zero. Then, apart from unnecessary constants,

$Iu + \tau \varphi = 0; -\varphi = Iu / \tau \dots \dots \dots (1)$

Again, in case of deflection φ' in a magnetic field of intensity H parallel to the coils,

$Iu \cos \varphi' + \tau \varphi' + H u' \sin \varphi' = 0.$

Supposing the deflections very small,

$\varphi' = Iu / (\tau + H u') \dots \dots \dots (2)$

Now, in an incidental adjustment I found $\varphi = 4.35; \varphi' = 4.00$. Hence,

$$\frac{\tau}{H u'} = \frac{400}{35}.$$

In other words, the magnetic resistance is about one-tenth the torsional resistance to deflection by current. Now, inasmuch as deflections are used only to correct the torsion value, which is increased or decreased in single degrees, the effect of magnetic resistance is quite negligible. In measuring 100° , $\varphi = 4.35$, and the correction must be less than .6. Hence the magnetic resistance is less than .06, or less than 1.5 per cent of φ . But inasmuch as the apparatus is primarily intended for temperatures greater than 350° , where $\varphi > 20^\circ$, it follows that the magnetic resistance is usually quite negligible. A little care in the magnetization of the needle will produce the astatic condition much more fully than was done in the above experiment. The same relations apply for finer fibers, where twists are larger.

A few examples of the deflection D for 100° at the hot junction, in case of a thick platinum fiber (diameter .0055 centimeter), and variety of different magnetic fields may be added.

Factor.	D	Remarks.
.893	7.235	{ Strong field. Magnetic zero obtained by astasizing magnet.
	7.235	
3.45	7.324	{ Astatic needle. Fiducial zero obtained by twisting.
	7.319	
3.08	7.290	{ Astatic needle. Coils in its plane.
	7.276	
3.402	7.440	{ Astatic needle, kept in the plane of the coils by twisted fiber.
	7.437	
	7.434	

It follows finally that in the above instrument thermoelectromotive force is expressed only in terms of the torsion of a platinum fiber, supposing the needles to be so tempered and magnetized as not to change their magnetic permanence. Hence thermoelectromotive forces are not only expressed in terms of a fixed standard and therefore comparable with each other after the lapse of time, but the range of measurement is enormous. Any temperature between 100° and the intensest white heat may be measured without further adjustment. These desiderata, added to the convenience of manipulation, and the strength of the instrument against wear and tear, constitute the advantages of the galvanometer described.

In the practical form of this apparatus the torsion circle need not be more than 6 inches in diameter, accurately divided into degrees. The alidade should be provided with a lens. A silk fiber suspension may be put in the case *xy*, so that the needle may at any time be unhitched from the platinum fiber, and attached to the silk fiber. A magnetic position of equilibrium parallel to the coils is thus easily obtained.

Inasmuch as both the internal resistance of the coils, the magnetic movement of the needles and the elasticity of the platinum fiber change with temperature, the torsion galvanometer has a notable temperature coefficient. This, however, is determined at once by measuring the same temperature (hot junction) at two different temperatures of the galvanometer. The boiling point of mercury is a convenient datum for this purpose. Changes of temperature at the galvanometer are to be guarded against by placing a thermometer in the case.

7. *Cold junction*.—From what has been stated, if D be the amount of torsion corresponding in a given instrument to the temperatures T and t of the junctions of the given thermocouple,

$$D = a(T - t) + b(T^2 - t^2) \dots \dots \dots (1)$$

$$\text{Again if } d = a(t - 20) + b(t^2 - 20^2) \dots \dots \dots (2)$$

$$D_{20} = D + d = a(T - 20) + b(T^2 - 20^2) \dots \dots \dots (3)$$

Hence a small table corresponding to equation (2) is to be computed, from which the value of d for each value of t between 10° and 35° may be taken. A short preliminary calibration suffices for this purpose. In this way the observer may at once deduce D_{20} from D , where D_{20} is a function of T the temperature of the hot junction only.

By aid of the boiling points of water (100°), mercury (357°), sulphur (448°), cadmium (780°), zinc (930°), bismuth ($1,500^{\circ}$), the quantity D_{20} may then be graphically constructed as a function of T , and the points between consecutive boiling points filled in by equation similar to (1).

From a chart of this kind the temperature T , corresponding to any degree of twist D_{20} , may be taken with facility.

OBSERVATIONS.

8. *Mercury*.—In the above apparatus the normal boiling point of mercury is sharply determinable; but there is considerable difficulty in

determining the low-pressure boiling points. Unless the heat be regulated to a nicety the lower layers boil under the pressure of the upper layers. Again, since the agitation of the liquid nearly ceases in approximate vacuo, a flame of moderate intensity presupposed, the rate of evaporation is retarded in relatively greater degree. In the case of a liquid of small specific heat, films of which do not adhere readily to glass, it is therefore to be suspected that both liquid and vapor will be superheated. On the other hand, if the flame of the burner be intensified so as to produce violent ebullition at low pressures, the liquid can be superheated to such an extent that its direct radiation on the junction of the thermocouple may heat it as much as 10° above the boiling point.

Accordingly I was not surprised that the temperatures obtained in the static method by Regnault, Hagen, Hertz, Ramsay and Young¹ are as a rule below the corresponding boiling points of the present dynamic method. It is only by taking great pains in the adjustment of burner and apparatus that my temperatures began to coincide with those of Regnault. But this nice adjustment introduces arbitrary conditions; hence low pressure mercury boiling points are to be rejected. At high pressures the unsatisfactory circumstances mentioned fall away; and the rate at which boiling point changes with pressure is enormously smaller.

In the following tables, 1 and 2, I give instances of my results. The data of Table 1 were obtained at an earlier date, before I became aware of the grave difficulties encountered. T is the boiling point for the pressure P , in centimeters of mercury:

TABLE 1.—*Boiling points of mercury (superheated)*

P	T	P	T	P	T
<i>cm.</i>	$^{\circ}C.$	<i>cm.</i>	$^{\circ}C.$	<i>cm.</i>	$^{\circ}C.$
44.2	330	.5	194	0.3	198
37.5	325	6.4	256	0.3	184
17.5	290	12.0	280	0.1	183
1.0	195	25.2	310		
0.7	190	47.6	336		
0.5	176	76.2	356		
13.3	279	.2	199		
24.4	304				

In the following table are later results, obtained with great care, relative to the conditions stated at the outset of the present paragraph. The agreement with Regnault's data is very much better, but the temperatures are still high, particularly in the region of low pressure (cf. Fig. 2). D_{20} , the twist corresponding to T , has been added, to show the

¹Ramsay and Young; Jour. Chem. Soc., vol. 49, p. 37, 1887; Landolt and Boernstein's tables, p. 56, Berlin, Julius Springer, 1883. I may advert in passing to a discussion between Messrs. Ramsay and Young and Kahlbaum. The former, corroborating Regnault's law, maintain that vapor tensions, whether obtained by static or dynamic mode of measurement, are identical. Kahlbaum believes that he has found a difference. Cf. Beiblätter, vol. 10, 1886, p. 485; *ibid.*, vol. 11, 1887, pp. 88, 430.

delicacy of the apparatus, Pl. II, p. 14. Twist is expressed in degrees of arc :

TABLE 2.—Boiling points of mercury (superheated).

<i>P</i>	<i>D</i> ₂₀	<i>T</i>	<i>P</i>	<i>D</i> ₂₀	<i>T</i>
·1	8·10	164	·2	8·40	168
·2	8·10	164	·3	8·28	166
·2	8·11	165	·5	8·49	170
2·6	11·43	216	2·0	10·84	208
2·7	11·58	218	2·3	11·25	214
2·7	11·62	219	5·2	12·93	239
4·5	12·22	228	9·9	14·98	270
4·6	12·23	229	9·8	14·87	268
12·6	15·44	276	17·2	16·24	288
12·5	15·43	276	17·4	16·23	288
20·7	16·90	297	31·5	18·07	313
20·9	16·95	298	31·8	18·10	314
29·4	17·75	308	50·3	19·69	335
29·4	17·74	308	50·5	19·74	335
47·3	19·58	334	76·43	21·484	358
48·0	19·65	335			
48·5	19·75	336			
76·43	21·323	357			

9. *Sulphur*.—The behavior of sulphur is peculiar. On removing the pressure to about 1^{cm}, the substance soon passes into the treacle state, and the full ebullition observed under atmospheric and other pressures changes into a sticky frothing.

Exact temperature data can not, therefore, here be expected. The following table (3) is an example of the earlier results obtained:

TABLE 3.—Boiling points of sulphur.

<i>P</i>	<i>T</i>	<i>P</i>	<i>T</i>	<i>P</i>	<i>T</i>
<i>cm.</i>	° <i>C.</i>	<i>cm.</i>	° <i>C.</i>	<i>cm.</i>	° <i>C.</i>
·0	218	4·8	298	21·2	374
·0	205	7·0	316	39·8	410
2·4	263	11·2	337	76·0	448

The following table contains results of a later date, obtained by taking great care in guarding against superheating:

TABLE 4.—Boiling points of sulphur.

<i>P</i>	<i>D</i> ₂₀	<i>T</i>	<i>T</i> <i>Regnault.</i>	<i>P</i>	<i>D</i> ₂₀	<i>T</i>	<i>T</i> <i>Regnault.</i>
55·36	26·57	428	429	4·06	16·80	295	305
55·41	26·59	429	429				
54·75	26·49	427	428				
48·30	25·87	420	422	30·69	23·65	389	396
47·78	25·64	416	421	30·70	23·65	389	396
37·59	24·51	402	407	13·01	20·18	342	354
37·57	24·39	399	407	12·93	20·18	342	354
28·67	23·44	386	393	5·61	17·28	302	317
28·80	23·51	387	394	5·91	17·51	305	320
20·68	22·23	370	376	6·14	17·62	306	321
20·70	22·25	370	376	3·29	15·55	278	295
14·37	20·76	349	358	3·44	15·51	277	297
14·49	20·73	348	359	·75	10·76	206	252
11·15	19·66	355	346	1·05	11·33	215	*260
11·25	19·77	336	347	1·39	11·85	223	*266
6·11	18·05	313	321	1·67	11·21	228	*275
6·35	18·20	315	323	75·84	27·976	446	448
6·55	18·30	316	324	75·87	27·999	448	448

* Sulphur sticky.

These results agree fairly well with those of the earlier table. I have added the values of T , interpolated graphically from Regnault's data, by aid of the Dupré-Bertrand equation. (Cf. § 14.)

$\text{Log } p = 19.10740 - 4684.49/\theta - 3.40483 \log \theta$, which holds between $\theta = 663$ and $\theta = 843$ absolute degrees centigrade¹. It will be seen by comparison of my values with the data predicted by this formula that it is much in error at low pressures. The divergence is largest in the neighborhood of 11^{cm}, and is here greater than 10°.

10. *Zinc*.—The following table contains data of four sets of experiments for zinc. The first of these were made in the glass tube (Fig. 1) at low pressures. Although in this case there was considerable volatilization, I did not observe any ebullition. In the table, the result marked * is the only datum of this work inserted. Change of temperature with pressure was not very obvious.

The remaining data of this part of the table are legitimate. The criterion of a boiling point is change of temperature with pressure. In the second and third parts of the table I aimed at greater accuracy. Each of the values given is a mean of two or three distinct measurements; † refers to a low position, ‡ to a high position of the thermocouple in the central tube (see Fig. 2).

TABLE 5.—*Boiling points of zinc.*

P	T	P	T	P	T
<i>cm.</i>	<i>°C</i>	<i>cm.</i>	<i>°C</i>	<i>cm.</i>	<i>°C</i>
1.0	*582	4.2	710	2.6	675
4.0	710	3.5	699	6.7	731
6.5	732	2.8	684	15.8	792
9.6	757	6.2	736	26.4	833
10.1	772	9.9	758	37.5	864
15.6	785	16.6	802	47.3	884
27.1	837	26.4	838	57.0	904
34.5	857	36.8	863	65.4	916
42.5	873	47.7	884	77.1	933
53.5	897	55.7	900		
76.4	933	65.3	914		
		77.3	†928		
		77.3	‡922		

11. *Cadmium*.—The first part of Table 6 contains results obtained in a glass tube. Ebullition in vacuum was obvious. But inasmuch as the limit of the power of the ring burner was not much above 500°, the remaining thermal data are too low.

The experiments of the second and third parts of this table were made in the porcelain crucible. They are legitimate, change of temperature taking place with every change of pressure. I was unable to make the crucible satisfactorily tight, so that mean values of fluctuating pressure had to be made use of. Again cadmium is more easily superheated than zinc; so that the present temperatures are probably high.

¹I computed the inferior prolongation of the curve and plotted the results. From the chart the values of T were taken to a high degree of accuracy.

A repetition of the experiment failed in consequence of breakage of the crucible. It is interesting to note here that if zinc boils at 930° , cadmium will boil at a temperature not much below 780° .

TABLE 6.—*Boiling points of cadmium.*

<i>P</i>	<i>T</i>	<i>P</i>	<i>T</i>	<i>P</i>	<i>T</i>
<i>cm.</i>	$^{\circ}\text{C.}$	<i>cm.</i>	$^{\circ}\text{C.}$	<i>cm.</i>	$^{\circ}\text{C.}$
.00	444	2.2	549	6.3	606
2.75	526	2.5	552	8.4	622
5.25	549	2.6	565	22.6	686
7.70	562	3.2	574	27.4	704
		7.5	620	34.2	722
		10.5	639	51.0	752
		15.7	667	56.3	760
		18.9	681	63.6	770
		26.2	702	65.6	772
		29.2	706	75.5	786
		35.5	724	75.5	788
		38.1	729	75.5	781
		48.9	745		
		51.7	750		
		62.4	760		
		64.4	766		
		65.6	766		
		75.6	772		
		75.6	770		
		75.6	774		

12. *Bismuth.*—Table 7 contains results for bismuth. In the first part of the table temperature does not change with pressure, hence a boiling point is not reached. In the second part of the table temperature certainly oscillates with pressure, hence the temperature corresponding to the lower values of pressure (3 to 4 cm.) are boiling points. The temperatures corresponding to the higher values of pressure (9 to 10 cm.) are below the corresponding boiling points, for I found that on further increasing pressure, the temperature did not increase. These temperatures are therefore at the limit of the heating power of the furnace. At least five minutes must be allowed for each observation. The top of the crucible, moreover, should be filled with asbestos, to diminish loss of heat by radiation.

TABLE 7.—*Boiling points of bismuth.*

<i>P.</i>	<i>T.</i>	<i>P.</i>	<i>T.</i>	Remarks.
<i>cm.</i>	$^{\circ}\text{C.}$	<i>cm.</i>	$^{\circ}\text{C.}$	
2.6	1152	3.2	1199	
5.8	1164	8.6	1211	
2.6	1165	9.7	1207	
8.1	1182	3.2	1206	
8.8	1186	3.7	1222	Flame intensified. B. P. criterion satisfied.
2.7	1183	4.2	1215	
9.8	1194	8.7	1247	
2.4	1186	3.9	1213	
		3.4	1204	
		9.5	1236	
		3.4	1207	
		4.0	1217	
		9.7	1260	
		3.4	1206	
		3.9	1221	
		9.6	1258	Limit of the heating power of the burner.
		3.3	1215	
		4.2	1233	

13. *Remarks.*—In the above tables, 1 to 7, the criterion of boiling point has therefore been change of temperature with pressure. When this was not observed, the data were rejected. The method of obtaining low boiling points from the liquid is doubtless objectionable, because of the liability to superheating. In special measurements made with zinc,¹ however, I found that the error thus introduced is negligible. There seems to be less superheating in case of metals and high temperatures, supposing the temperature of the environment to be reasonably near the boiling point (100° or 200° above it). In case of bismuth and metals of higher boiling points, the difficulties of experiment are such that I do not think a low pressure vapor bath is feasible.

In regard to the crucible used, I may remark that experimentation will be much facilitated by using tubular forms made in a single piece. In this case the trouble experienced in calking the joint of Figure 1 will be obviated. The metal, previously granulated, may easily be introduced through the tube *d*. In this case I have no doubt that very high vacua at white heat will be attainable. It is advisable, moreover, when very high temperatures are to be reached, to place the crucible and lid wholly within the furnace, allowing only a narrow tube to project out of it.

INFERENCES.

14. *Available equations.*—Equations for expressing vapor tension in terms of temperature have been invented in great number, and among them the simple form of Magnus and the more elaborate exponential devised by Biot and used by Regnault are given in most text books. A remarkably close fitting exponential is investigated and tested by Bertrand.² Quite recently M. Ch. Antoine³ has proposed and applied a new form. Following the early suggestions of Bertrand⁴ and of J. J. Thomson,⁵ I have used the equation of Dupré,⁶

$$\log p = A - B / \theta - C \log \theta \dots\dots\dots (1)$$

inasmuch as J. J. Thomson has given it an independent interpretation. The meaning of the equation is clearer in the differential form:

$$dp / d\theta = -p (C / \theta - B / \theta^2) \dots\dots\dots (2)$$

or

$$d\theta / dp = \frac{\theta^2}{p} \frac{1/B}{1 - (C/B)\theta} \dots\dots\dots (3)$$

with reference to which it is to be observed that C/B is a small quantity (about 1/1000).

¹ Bull. U. S. Geol. Survey, No. 54, p. 109.

² Bertrand: Thermo dynamique, pp. 154 to 162, Paris, Gauthier-Villars, 1887.

³ Ch. Antoine: C. R., cvii, p. 681, 1888; *ibid.*, pp. 778, 836, 1888.

⁴ Bertrand: *loc. cit.* p. 90 to 102.

⁵ J. J. Thomson: Applications of dynamics, etc., p. 158, Macmillan, 1888.

⁶ Dupré: Théorie mécanique de la chaleur, pp. 96 to 110, Paris, Gauthiers-Villars, 1869.

15. *Constants computed.*—Applying equation (1) to the results of the tables 1 to 7, I found the following set of values by direct computation:

TABLE 8.—*Constants. A, B, C, variable.*

Metal.	A	B	C
Mercury	+ 3.583	+3084	— 1.1371
Sulphur.....	—35.969	— 366.1	—13.066
Cadmium	—30.567	+1391	—11.180
Zinc	+42.265	+11435	+10.022
Bismuth	+24.774	+13495	+ 4.763

These results are grossly irregular, even as to sign. This might have been expected. To get comparable values for constants the observations in case of complex equations must either be very fine or in great number. Other direct methods gave similarly irregular constants, which need not be entered here. Nothing can be learned from them.

Bearing in mind, therefore, that it is my object to detect possible relations, and that my high-temperature boiling points are necessarily somewhat crude, I will facilitate preliminary computation by observing that in Dupré's data the prevailing value of A is nearly 20. Putting $A=20$ the following set of constants were obtained, in which, of course, there is greater degree of uniformity. Water has been added from Dupré:

TABLE 9.—*Constants. B and C, variable.*

Substance.	A	B	C
Water	20.324	2795	3.868
Mercury.....	20	4345	4.013
Sulphur.....	20	4379	4.217
Cadmium	20	7467	3.643
Zinc	20	8433	3.603
Bismuth	20	12561	3.456

The results of this table are encouraging. From an inspection of the constants I was led to suspect better agreement in making C constant and A variable. This step is further suggested by assuming, conformably with the indications of table 9, that for any two substances, S and S' , the boiling points, θ and θ' , corresponding to a given pressure, p , will follow the relation $B/B' = \theta/\theta' = n$, where n is constant for the given pair of substances. This virtually postulates a fundamental equation of the form (1) from which all others are derived by substitution, as follows:

$$\log p = A - B/\theta - C \log \theta \dots \dots \dots (1)$$

$$= A - nB/n\theta - C \log n \theta + C \log n$$

$$= A' - B'/\theta' - C \log \theta' \dots \dots \dots (4)$$

The constants of Table 10 are obtained by supposing C to be constant for all the substances. As to the choice of a value, I noticed that the mean C of Table 9 is almost identical with Dupré's C for water. Hence it was chosen.

TABLE 10.—Constants *A* and *B*, variable.

	<i>A</i>	<i>B</i>	<i>C</i>
Water	19.324	2795	3.868
Mercury	19.029	4396	3.868
Sulphur	19.776	4458	3.868
Cadmium	20.63	7443	3.868
Zinc	20.98	8619	3.868
Bismuth	21.51	12862	3.868

The constants might be much improved by successive trials; but further work would be wasted.

16. *Graphic representation.*—In order to clearly exhibit the point of view I have taken, it will be necessary to plot these results graphically. This is done in Plate III, in which the abscissæ are pressures in centimetres of mercury and the ordinates boiling points in degrees centigrade.

The curves passed through the observations are computed for the constants of Table 8. Some points computed by Table 9 are marked; points computed by Table 10 are also marked. The agreement of observed and computed results is quite within the errors of observation, as will at once be evident from an inspection of the chart. In case of mercury I have added the vapor tension results of Regnault, showing that they are uniformly lower than the present data. The reasons have already been given in § 8.

The results for bismuth are particularly interesting. Unfortunately it was impossible for me to cask the crucible tight enough, in order that the low-pressure boiling point of bismuth might overlap the normal boiling point of zinc, which limits the calibration interval of the thermo-couple. The chart shows that the interval of extrapolation is about 270°. This makes the bismuth results less certain. For this reason, perhaps, the normal boiling point of bismuth, as deduced by Groshans's principle is too high, being 1550°. Carnelley and Williams,¹ using a calorimetric method, obtained only 1450° as their maximum value. It is probable, however, that the radiation errors in Carnelley and Williams's experiments would tend to make their data too low; nor have they any sure criterion that ebullition had actually set in. In experiments of my own,² using a Fletcher furnace with three blast burners, I signally failed to boil bismuth in a number of trials. The boiling-point criterion in the present results is beautifully exhibited: When pressure increases the group of points *B* on the chart pass into the group of points *A*; hence the group *B* are boiling points. When pressure increases further the group *A* does not increase in temperature; hence group *A* are not boiling points, but merely indicate the maximum heating power of the furnace.

17. *Conclusion.*—I am perfectly aware that the method pursued above, in endeavoring to reach perspicuous results, is forced. Ber-

¹ Carnelley and Williams, Journ. Chem. Soc., London, vol. 35, 1879, p. 565.

² Bull. U. S. G. S., No. 54, pp. 116-118, 124.

trand computes the constants of Dupré's formula for 16 substances, and shows its admirable agreement with the observed data throughout. But the constants in such a case vary largely: A between 4 and 21 (pressures being expressed in centimeters of mercury); C between -9 and $+5$. In any such grouping of constants as I have attempted, the agreement of the formula would therefore be lost. It is worthy of remark, however, that in 10 out of the 16 substances A lies between 15 and 21.5, and in one-half of the substances C lies between 3.2 and 4.2.

When, however, the errors left in any attempt to group the constants are considered, not so much with reference to the small range of temperatures of a single substance, but rather with regard to the relatively enormous range of temperatures exhibited by these phenomena as a whole, and by a diagram, such as Pl. III, for instance, then the errors in question assume much smaller importance. In the above pages I have presumed to believe that at the outset the wide temperature comparison is the one which ought first to be made, and some fundamental relation applicable to the whole range of temperature investigated. After this has been done, the said relation may then be modified to suit the individual and exceptional case.

I can state this more clearly as follows: Groshans's derivation of his principle is sufficiently simple; for, if vapors have identical coefficients of expansion, $1/273$, say, and their densities be expressed relatively to the density at the normal boiling point in each case, then the ratio of absolute boiling temperatures corresponding to any two given pressures will be the same for all vapors. This inference is incorrect just in proportion as the application made of the Boyle-Charles law is incorrect.

However, Dupré in deriving his formula makes virtually the same assumption.¹ Again, J. J. Thomson² introduces Boyle's law into the mean value of the Lagrangian function investigated for the present phenomena. Inasmuch, however, as the forms of two arbitrary functions have here to be determined by experiment, the insertion of Boyle's law suffices Thomson's purposes. Following the model of his work, I hoped to find some suggestion as to the modification of Dupré's equation, such that it may be the outcome of an original type for all substances, by inserting Van der Waals's law, $p = R\Theta/(v-b) - a/v^2$, instead of Boyle's law into the proper term. It seemed plausible that Dupré's equation could thus be corrected by aid of constants, the molecular interpretation of which has already been given by Van der Waals. Performing the operations, I find, rigorously,

$$R\theta \log \frac{\rho_0}{\rho} \frac{\zeta - b\rho}{\zeta - b\rho_0} = -R\theta \left(\frac{\zeta}{\sigma} \frac{\rho}{\zeta - b\rho} - b \frac{\rho_0}{\zeta - b\rho_0} \right) + \frac{a\rho}{\zeta^2} \frac{\rho - \sigma}{\sigma} + (w - w') - \psi(\theta)$$

where a and b are Van der Waals's constants. This equation, though capable of simplification, essentially involves ζ , and is therefore not suggestive.

¹ Bertrand: loc. cit., p. 101.

² Thomson: loc. cit., p. 158.

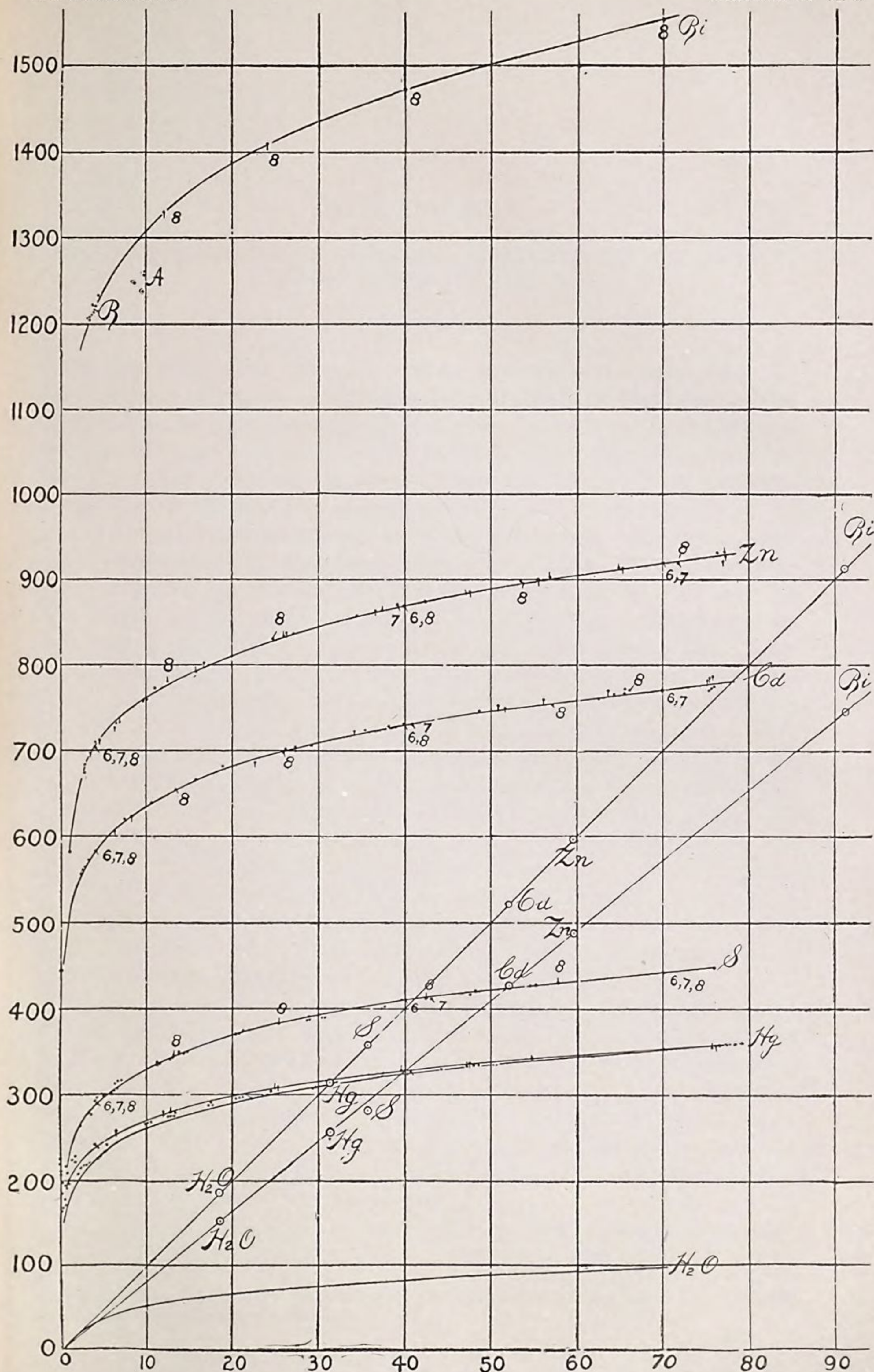


CHART SHOWING THE CHANGE OF BOILING POINT WITH PRESSURE (CENTIMETERS OF MERCURY)
FOR WATER, MERCURY, SULPHUR, CADMIUM, ZINC, AND BISMUTH.

CHAPTER II.

THE CONTRACTION OF MOLTEN IGNEOUS ROCK ON PASSING FROM LIQUID TO SOLID.

INTRODUCTORY.

18. *The rock*.—The following volume measurements were made for Mr. Clarence King, on a sample of diabase which he furnished. The object thus far is to develop the general character of the expansion phenomenon, and for this reason a fusible rock, without action on hot platinum, was selected. In future researches, graded rock magmas, passing from extreme acid to extreme basic, will be operated on.

19. *Literature*.—The importance of the question is well known, but a literary discussion is superfluous here, since Prof. F. Niess¹, of Hohenheim, not long ago made a careful survey of all that has been done on the subject. The reader desiring specific information is referred to this interesting pamphlet. “Es ist ein durch Contraste buntes Bild,” says Prof. Niess (*loc. cit.*, p. 36), “welches in der vorstehenden Citatenlese dem Leser zu entrollen war, und aus dem Wirrwarr entgegengesetzter Ansichten heben sich nur zwei Körper: Wismuth und Eisen, heraus, über welche man wohl mit absoluter Sicherheit die Acten als geschlossen bezeichnen kann, und zwar in dem Sinne, dass für sie die Ausdehnung im Momente der Verfertigung als zweifellos bewiesen gelten kann. Die übrigen Metalle stehen noch im Streit, und für sie gilt das Gleiche was wir für die künstlichen Silicate zu fordern hatten * * *” Now, iron, in virtue of the occurrence of recalescence (Gore, Barrett), is scarcely a fair substance to operate upon, and it heightens the confusion to find that Prof. Niess, after carefully weighing all the evidence in hand, is obliged to conclude that rocks expand on solidifying.

The present experiments show beyond question, I think, that at least for diabase this is not true. I find that this rock not only contracts between 3.5 to 4 per cent on solidifying, but that such solidification is sharp and only apparently continuous, and that the fusion behavior throughout is quite normal in character. Hence with certain precautions which I shall specify in the course of this paper, §21, the volume thermodynamic relations which I deduced by acting on organic bodies may be applied to rock magmas.

20. *Effect of fusion (polymerism)*.—The rock after fusion is changed to a compact black obsidian and quite loses its characteristic structure.

¹Niess: “Ueber das Verhalten der Silicate, etc.,” Programm zur 70. Jahresfeier d. k. Würtemb. landw. Academie. Stuttgart, E. Koch, 1889.

It was therefore important to examine the volume relations of this change preliminarily. This is done in Table 11, where the densities obtained with lumps of the rock (mass M), at the temperature t , are given, Δ being the density before, Δ' after, fusion.

TABLE 11.—Density, Δ , of the diabase, before and after fusion. Massive pieces (not ground).

A.—BEFORE FUSION.

Sample No.	M	t	D	m	d	Δ	$\frac{\Delta - \Delta'}{\Delta}$	Remarks.
I	g 22.8950	$^{\circ}C$ 25	.....	.....	.....	3.0161	.....	
II	45.3654	21	.....	.....	.....	3.0181	.....	
III	54.7208	21	.....	.....	.....	3.0136	.....	
IV	69.4940	21	.....	.....	.....	3.0235	.....	

B.—AFTER FUSION.

I	60.9330	21	.....	.....	.....	2.7018	.104	{ Fused in clay crucible. Lump broken out when cold.
II	33.7659	19	3.5013	11.1686	21.021	2.7447	.090	
III	29.9777	19	3.5496	11.2712	(21.00)	2.7045	.103	{ Fused in a platinum crucible.

The rock was fused both in clay and in platinum crucibles. In the latter case the density d of the known mass m of the platinum crucible had been previously determined, and D denotes the observed density of molten rock and crucible together after fusion. In the case where a clay crucible was used, this was broken away from the glass within and the density of the solid lump (glass) then measured directly.

A few small air bubble cavities were visible on the fresh fractured surface of the glass, due, I presume, to the possibility that most rocks, like most organic liquids, hold gases in solution, which separate on solidification. At some other time I will make sharp vacuum measurements of the density of ground powders both of the rock and of the glass, but I do not believe the results of Table 1 will be seriously changed by such a test.

From Table 1 it appears that the mean density of the original rock is 3.0178. That of the glass after fusion is 2.717, showing that the result of fusion has been a volume increment of 10 per cent. This remarkable behavior is not new nor isolated. Niess (l. c., p. 47), quoting from Zirkel's Lehrbuch, shows even more remarkable volume changes of the same nature in garnet, grossularite, vesuvianite, adularite, orthoclase, augite; but I doubt whether the great importance of this behavior has been sufficiently emphasized. Suffice it to indicate here that it makes an enormous difference into what product the magma is to be conceived as being solidified, and that throughout this paper the molten rock solidifies into an obsidian. I am really only determining, therefore, those

volume changes which lie at the margin, as it were, of the more profound but chemically structural volume change, which latter may be reasonably conceived as producible by pressure alone under conditions of nearly stationary (high) temperature.

I may add in passing that, from the magnitude of the chemical change, I shall carry my work on the effect of pressure on chemical equilibrium of solids and liquids and on the solution behavior "solid-liquid" into greater detail than I have hitherto attempted.¹

APPARATUS.

21. *Temperature measurement.*—In work of this kind, an apparatus for the accurate measurement of high temperatures is the fundamental consideration. I may, however, dismiss this subject briefly here, since I discussed it elaborately in Bulletin No. 54, U. S. Geological Survey. The temperature measurements of this paper were made with thermocouples of platinum and platinum with 20 per cent of iridium, and they had been frequently calibrated by aid of the porcelain air thermometer within an interval of 1100° and tested for freedom from anomalies beyond that interval. Reference to the bulletin cited will show how thoroughly reliable this thermocouple is. Inasmuch as the process consists in expressing thermoelectric force by aid of a zero method in terms of a given Latimer Clark cell, the temperature apparatus is of the same order of constancy as to time as the standard cell.

In order to find, however, how far this work was trustworthy after a lapse of more than four years since it was done, I made fresh check measurements of the boiling points of mercury and of zinc. The latter need only be cited here. My original datum of the boiling point of zinc expressed as thermoelectric force for the couples under consideration was $e_{20} = 11,074$ microvolts, the cold junction being at 20°C . The new experiments referred to gave me data as follows:

	Microvolts.
Thermocouple No. 35	$e_{20} = 11,168$
No. 36	$= 11,127$
No. 39	$= 11,116$
No. 40	$= 11,136$
Mean	$= 11,137$

agreeing very closely with two subsequent, specially careful measurements, viz:

	Microvolts.
No. 36	$e_{20} = 11,131$
No. 39	$= 11,134$

Thus the difference of values new and old is only 60 microvolts about $\frac{1}{2}$ per cent as regards electromotive force, corresponding to something over 4° at 1000° . In view of the excessive use and abuse to

¹ Am. Journal, vol. 37, p. 339, 1889; *ibid.*, vol. 38, p. 408, 1889; *ibid.*, vol. 40, p. 219, 1890; *ibid.*, vol. 41, p. 110, 1891; *ibid.*, vol. 42, p. 46 et seq., 1891; Phil. Mag., (5), vol. 31, p. 9, 1891.

which the couples had been put in the meantime, this result is in itself gratifying.

Endeavoring to find, however, where this discrepancy was to be sought, I also made fresh comparisons between the Latimer Clark standard and a normal Daniell of my own (bulletin cited, p. 100), in which the two cells are separate and only joined (with zinc sulphate solution) during the time of use. Supposing the Latimer Clark cell to have remained constant the succession of following values was found:

March,	1886, 20° C., L. C., $e = 1.435$	Daniell, $e = 1.138$
August,	1887, 28° C., 1.435	1.139
September,	1891, 27° C., 1.435	1.147

If, therefore, instead of regarding the L. C. cell constant, I had assumed the Daniell as constant¹, the thermoelectric difference for the interval of four years would be wiped out. Now my L. C. cells were made by me in 1883, when less was known about the subject than is now available². I conclude therefore that the discrepancy is very probably in the standard cell employed and that my thermocouples have remained absolutely constant.

Apart from this, the new standardization by aid of the boiling point of zinc fixes the scale irrespective of surmises or hypotheses, assuming that zinc boils at 930°.

22. *General disposition of apparatus.*—This is given in Pl. IV, on a scale of $\frac{1}{2}$, where figures 1 and 3 form a sectional elevation showing the parts chiefly with reference to their vertical height, and figure 2 a sectional plan in which the parts are represented with reference to the horizontal.

The molten rock *ZZ* contained in a long cylindrical platinum tube, largely surrounded by a tube of fire clay, *FF*, is fixed vertically in a long cylindrical furnace, *DD LL*. The heat is furnished by six burners, *BB*, fed by gas and an air blast laden, if need be, with oxygen. These burners are placed at equal intervals along the vertical, three on one side and three on the other (Pl. IV, Fig. 2), and set like a force couple so as to surround the platinum tube with a whirlwind of flame. Suitable holes are cut in the walls of the furnace for symmetrical insertion of the insulated thermocouples, *T*, and also at *S*, for fixing the sight tubes, *A*, near the top and the bottom of the furnace. Parts of the envelopes of the platinum tube are cut away, so that its upper and lower end can be seen in the telescope of an external cathetometer. Thus the expansion of the platinum tube is measured directly. A vertical micrometer, *Kkd*, Pl. IV, Figs. 3 and 4, insulated so as to admit of electrical indications of contact, furnishes a means of tracing the apparent expansion of the rock *ZZ*.

In principle the operations are so to be conducted that under the conditions of slow cooling the magma may be relatively much less

¹ Our laboratory affords no means for the direct measurement of electromotive force.

² See Lord Ragleigh in Phil. Trans., June, 1884, and Jan., 1886; also Carhart, Am. J. Sci., Nov., 1884.

viscous than the practically rigid platinum envelope throughout the work.

The furnace stands on a massive iron base perforated with eight holes, into which vertical iron uprights are screwed, symmetrically surrounding the furnace and at a distance of 4 or 5 centimeters from its circumference. Only one of these is indicated, in part, at *QQ*, in Pl. IV, Fig. 3, the rest with other subsidiary parts being omitted to avoid confusing the figure. Two of these uprights hold the vertical micrometer, two others hold the burners in place. To the fifth the sight tubes are adjustably attached, to the sixth the thermocouple insulators are clamped exteriorly to the furnace, and the remaining two fix the clay holders *H*, *H*, by which the tube *FF* is adjusted vertically. All of these uprights are hollow, and a current of water continually circulates through them with sufficient rapidity to issue finally still cold to the touch. In this way the observer is able to move and change the accessories of the furnace with comfort even when the temperature within is maintained at 1500°. A single stream of water is sufficient, the ends of the uprights being joined by rubber tubing, and this same current additionally flows through the screen *XX* of the vertical micrometer and the high vertical screen of the cathetometer.

23. *The furnace.*—It should be added to the remarks made in the preceding paragraph that all the burners *B*, *B*, Pl. IV, are fed by the same amount of gas and air by properly branching the large supply tubes. A graduated stop cock is at hand for regulating the supply of gas to a nicety, whereas the air blast need not be regulated. Hence the furnace is fed with a mixture of gas and air, and temperatures from 1600° to 400° may be obtained by simply making the influx richer or poorer in illuminating gas. Burner constructions suitable for this purpose are given in Bulletin No. 54, p. 182. For higher temperatures the blast may be made richer in oxygen, but I have thus far had no need of doing this.

The products of combustion are carried off by the two oblique tubes *E*, *E*, in the lid *LL*. Note that the water screen bends around the vertical micrometer in such a way that flames issuing from *E* can do no injury. The central narrow hole in the lid *L*, through which the end piece *dd* of the micrometer passes, is closed by a free plate of fire clay *mm* perforated so as to surround *dd* loosely.

The blast was furnished by a pair of large-sized Fletcher bellows, each with three sheets of rubber above the reservoir. These bellows were set so as to form a double-acting pump, and actuated by aid of a short crank on the axle of a small gas engine. The blast pressure so obtained is considerable, a requisite in the above instances. It can be regulated by lengthening or shortening the crank, whereby the arc of reciprocal motion of the bellows is increased, the frequency remaining unaltered. The efflux pipes of both bellows discharge into a common gas pipe leading to the furnace.

In order to obtain greater constancy of temperature and increase the high temperature efficiency of the furnace at the same time, it is es-

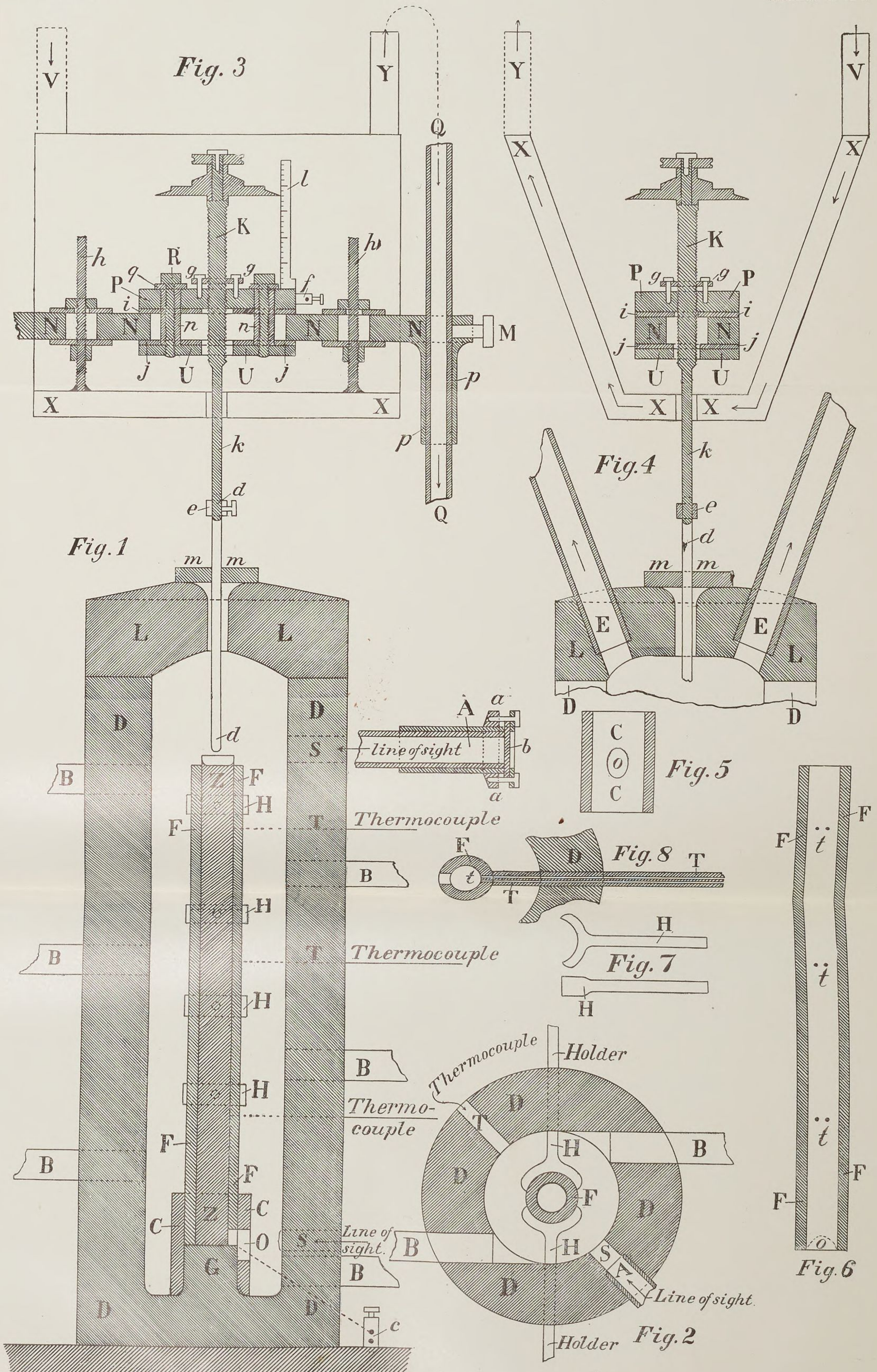
essential to jacket the furnace, *DD*, and lid, *LL*, externally with a coating of asbestos fully $\frac{1}{2}$ inch or more thick. I noted that in these cases the clay parts of the furnace became red hot throughout, whereas the uncovered furnace is not much above 400° externally. This indicates a smaller loss by radiation in the former case.

24. *Fusion tube*.—The platinum tube holding the molten rock, *ZZ*, Pl. IV, was 25 centimeters long and 1.5 centimeters in diameter, with walls about .02 centimeter thick. It was drawn as accurately cylindrical as possible, and the bottom was plane and at right angles to the axis. To protect this tube from gases and to keep it from bulging in consequence of the pressure of rock within, the platinum tube is surrounded by a fire-clay tube, Pl. IV, *FF*, Figs. 1 and 6, fitting loosely. Care must be taken to allow for shrinkage. Thus a fresh clay tube, after about two hours heating at 1500° shrank from a length of 25.4 centimeters to 24.6 centimeters, i. e., .8 centimeter or more than 3 per cent. This shrinkage is permanent and uniform in all directions, and is not, therefore, due to viscous sagging; after its full value has been reached, moreover, it ceases and the tube expansion is then normal. If properly sustained in the furnace the clay tube *FF* does not bend or warp. The holders, which I found very serviceable for this purpose, are shown at *H, H*, in Pl. IV, Figs. 1, 2, and 7. They are made of fire clay and held in position by suitable clamps on the outside of the furnace (not shown). In this way the fusion tube is to some extent adjustable.

The bottom of the tube, *FF*, is additionally fixed by aid of a perforated fire-clay ring, *CC*, Figs. 1 and 5, which embraces both the tube, *FF*, and a projection in the furnace, *G*.

25. *Thermocouples*.—These are three in number and inserted through the walls of the furnace, *DD*, Plate IV, in the positions given at *T*, in Figures 1 and 2. But Figs. 6 and 8 give a fuller account of the adjustment. The tube, *FF*, is laterally perforated with three pairs of fine holes, *t, t, t*, corresponding to the two canals in the insulator, *TT*. The wires of the thermocouple are then threaded through *t*, and the insulator in such a way that the junction lies in a small cavity at *t*, immediately in contact with the platinum fusion tube. A hole is cut in the tube, *FF*, opposite *t* (see Pl. IV, Fig. 8) and a similar one in the opposite wall of the furnace to facilitate these operations, the platinum tube being for the time removed. The advantage gained in this way is two-fold, since in the first place no part of the wires of the couple are directly surrounded with flame, and there is no danger of an accidental contact of these wires on the outside of the tube, *FF*. It is known that in the presence of carbon there is danger of passing silicon into the platinum, making the metal relatively fusible. Now, even if the hot gases of the furnace are reducing, they are to some extent stagnant in the insulating tubes, whereas in the flame they are constantly renewed. This I attribute to the protecting effect of the insulators.

The cold junctions of the thermocouples terminate in three pairs of mercury troughs, insulated by hard rubber, and submerged in a bath of



petroleum. With these troughs the terminals of the zero method, § 21, are connected at pleasure, so that the temperatures at the top, middle, and bottom of the fusion tube are easily determined. Data are given in full below.

26. *Sight tubes*.—It has been stated, § 22, that the increase of length of the platinum fusion tube, *ZZ*, is to be measured directly. For this purpose Grunow's excellent cathetometer is placed on a suitable pier on the outside of the furnace, so that the prism of the instrument is only about 50 centimetres off from the platinum tube. To obviate the hurtful effect of radiation, however, a tall, flat water screen, 30 centimetres broad, 70 centimetres long, and 1 centimetres thick, and movable on a slide, is placed between furnace and cathetometer. Slots closed by plate glass are cut through the screen to correspond to the two positions of the telescope, and the furnace walls, *DD*, are similarly perforated, at *S*, above and below (see Pl. IV, Figs. 1 and 2), so that the ends of the platinum tube may be seen. The top of the latter projects above *FF*; but this tube and the ring, *CC*, are perforated at *O*, as shown in Figs. 1, 5, and 6. When the furnace is red hot within, the end planes or lines stand out very sharply against the red-hot clay background, in consequence of a difference in the emissive power of the metal and the clay, and hence the measurement is possible with the necessary degree of accuracy.

It is essential, however, to prevent the escape of flame and gas at *S*, and this may be done by closing these holes with sight tubes (only one of which is shown, *A*) of porcelain and about 15 centimeters long. The outer end of these is ground off square and a plate of plate glass, *b*, held against it by aid of the clamping device, *aa*. Surrounding the porcelain tube, *A*, with a layer of asbestos, and cutting a thread on the inner face of the brass ring, *a*, the latter may be screwed on to the soft asbestos, and then serve to secure an iron ring by aid of two machine screws, as shown. The iron ring holds the glass plate, *b*, in place. This joint should be well made, for if there is an escape of hot gases here, the glass is apt to break, though I have had no serious accident of this kind. At first, drops of water collect on *b*, but they disappear as the temperature rises.

27. *Vertical micrometer*.—Figs. 3 and 4, Pl. IV, give a full account of this instrument, both of which are sectional elevations at right angles to each other. A good millimeter screw, *Kk*, plays easily through the massive block of brass, *PP*, and the fixed lock nut, *gg*, and *l* is the vertical millimeter scale whereby the motion of the graduated head is registered. The block, *PP*, is bolted down to the thick bridge of brass, *NN*, by means of the screws *R, R*, and the counter plate *UU*. The ends of *NN* are provided with sleeves, *pp*, and a clamp screw *M*, so that the whole micrometer may slide up or down, or be clamped in any vertical position on the uprights, one of which is indicated at *QQ*.

It has been stated that the registration of the micrometer is to be electric, and hence the screw, *Kk*, must be insulated. This is done by

surrounding the screws R, R , with a layer n, n , of hard rubber, from which the ends alone project, and insulating the plate, PP , and the counter plate of brass UU , by interposed sheets of hard rubber jj, ii , and the washers q, q .

In order to provide for a certain amount of horizontal adjustment of the micrometer, sufficiently wide slots are cut in the brass bridge NN , (see figures) whereby the plate, PP , may be shifted about 1 centimetre in any direction and then clamped in position.

In view of the heat which continually rises from the furnace, a V-shaped screen, XX , through which water rapidly circulates, nearly envelops the micrometer below. Water enters and issues through tubes V and Y at diagonally opposite corners of the top of XX . Inasmuch as the micrometer screw, Kk , passes through a narrow hole in the bottom of XX , this screen must also be capable of lateral adjustment, and this is easily accomplished by aid of two vertical screw hangers h, h , soldered to XX below and passing through wide slots in NN , to which they are secured in any horizontal or vertical position by suitably flanged nuts above and below NN . Thus it is seen that the micrometer and its water-screen slide as a single piece along the upright QQ , an arrangement which greatly facilitates the final adjustment. Q and Y are connected by a sufficient length of rubber tube, as is merely indicated in the figure. There is a like connection on the other side.

Finally, the end of Kk is prolonged by a straight cylindrical tube of platinum dd , which may be fixed to the steel rod k by aid of the clamp e in any position along the vertical. This tube dd fits the rod k snugly, and should it become bent or warped by accidents, a special steel rod is provided by means of which it may easily be straightened again.

The lower end of d is clearly visible in the telescope of the cathetometer through the sight tube A . On being screwed down it enters the fusion tube ZZ axially, supposing the micrometer and fusion tube to have been properly fixed in position. In how far this has been done can always be seen by temporarily removing one of the efflux pipes E , Pl. IV, Fig. 4, when the end of the fusion tube and the motion at the lower end of d is visible to the eye. On actuating the micrometer head of Kk , the lower end of d should show but slight lateral motion in the telescope. Usually the tube d becomes coated with an enamel of molten rock, but this is of no consequence, since the increase of length is noted in the measurements.

28. *Telephonic registration.*—Since it is the object to find how far the meniscus of molten rock ZZ , Pl. IV, lies below the plane of the top of the fusion tube, the moment of contact of ZZ and d is best registered electrically. So long as the interior of the furnace is red hot, the rock is a good electric conductor. Hence, if a current be passed into the screw Kk , at the clamp screw f , Pl. IV, Fig. 3, it will issue at the bottom at the clamp screw c , Pl. IV, Fig. 1, provided, of course, c be electrically

connected with the bottom of the fusion tube. This is easily done by placing the fusion tube on a plate of platinum above *G*, and connecting this with *c* by means of a platinum wire, as is indicated in the figure.

It is, however, very convenient to register the contact of *ZZ* and *d* telephonically, and this may be easily done by using the intermittent current of a small inductor like that of Kohlrausch. Contact then evokes a loud roar in the telephone, and the observer's attention is not further distracted. The adjustment is quite delicate, and if the glass *ZZ* be sticky, the drawing out of a thread is indicated by a gradual cessation of the noise in the telephone, etc. In fact, the character of the fusion may be pretty well inferred in this way. The instrument is available almost as far as 400° , at which time, however, the furnace is dark, and cathetometric measurement is no longer possible.

Care should be taken to secure small sparking distances, for this quantity will vary with the temperature of the gas in the furnace.

If the expansion of the rock be known, and the tube *dd* sunk deeply into the mass, it is clear that the present method admits of a measurement of the relation of electric resistance and temperature. I mention this, believing that a suitable method for temperature measurement may be thus available.

Elsewhere¹ I have already speculated on the character of the changes of electrolytic resistance referred to temperature. Should a hyperbolic law indeed apply, high-temperature measurement would be effectually promoted.

METHOD OF MEASUREMENT.

29. *Consecutive adjustments.*—Thus far it has been my object to study the contraction of rock only. For this purpose the graduated faucet is turned on full and the furnace fired as far as $1,400^{\circ}$ or $1,500^{\circ}$, when the first measurements are taken. With this end in view the length of the fusion tube is first accurately measured by the cathetometer observations at the bottom and the top. The telescope is then left adjusted for the top and the vertical micrometer (centrally adjusted) screwed down until its lowest point is just in contact with the cross hairs. After this the micrometer is further screwed down until the telephone registers a contact between the meniscus of the molten rock and the platinum micrometer tube. The difference of readings gives the depth of the meniscus below the top plane of the fusion tube. I usually repeated this measurement three times and then raised the micrometer screw again.

Thereupon the temperature measurements were made by connecting the terminals of the zero method consecutively with the upper, the middle, and the lower thermocouple.

Finally the cathetometer measurements of the length of the fusion tube and the micrometer measurement for depth of meniscus were again

¹ Am. Jour., Vol. XLII, pp. 134-135, 1891.

repeated, the latter three times. Properly uniform heating presupposed, it was permissible to regard the mean of the two sets of length measurements as coincident with the intermediate temperature measurement.

This done, I usually waited ten or fifteen minutes to make another complete measurement under better conditions of constant temperature.

The graduated stopcock was then partially closed by a proper fractional amount, and after waiting fifteen minutes or more the same measuring operations were gone through with as before.

This I continued until the slag became sticky and solidification imminent, when longer waiting and greater slowness in changing the temperature is essential. Fortunately the observer can note the state of things very accurately; for when the point of solidification is approached a thread of the magma is drawn out of the fusion tube by the ascending micrometer tube until it breaks to form a rounded coating on the end of the tube. As temperature decreases, even by small amounts, the time that it takes to break and round off increases until finally this pulling out of a thread ceases and the enamel on the end of the micrometer tube does not change its form, being solid. It is at this point ($1,095^{\circ}$) that the marked contraction of the molten mass in the tube occurs.

Having waited long enough for the lowest position of the meniscus, temperature may then be varied in larger steps again.

When the inside of the furnace has become dark, measurement is no longer possible. I then allowed the whole arrangement to cool over night, and the next morning determined both the depth of the solid meniscus by ordinary contact micrometric measurement, as well as by filling the top of the tube with water, and computing its bulk. This gives me my fiducial or normal volume.

To fill the fusion tube with rock at the outset of the work is a tedious operation. The material is added gradually in coarse grains, in proportion as the charge melts down, and after the tube is full some time must be allowed to insure the escape of air bubbles. Inasmuch as the fusion tube can at first be easily slipped out of its clay envelope, it is well to pack it as full of rock as possible before heating it.

30. Computation.—Let the linear expansion of the platinum fusion tube be given by $l=l_0(1+f(t))$, where l and l_0 are the lengths at t degrees centigrade and at zero, respectively, and where $f(t)$ is a function of temperature. Let λ and λ_0 be the depths of the meniscus below the plane of the top of the fusion tube, and v and v_0 the volume of the inclosed molten magma, at t degrees centigrade and zero, respectively. Then if $(1+f(t))^3$ is nearly enough equal to $1+3f(t)$; if the expansion constants of both platinum tubes be the same; and if in consideration of the small motion of the micrometer tube and the high temperature in the furnace, the air temperature above and outside of the furnace be nearly enough equal to zero, since $v_t/v_0=(l_0-\lambda)(1+f(t))^3/(l_0-\lambda_0)$.

$$(1) \dots\dots\dots (v_t-v_0)/v_0=3f(t)+(\lambda_0-\lambda)(1+3f(t))/(l_0-\lambda_0).$$

Here $3 f(t)$ is directly given after each observation as $(l_t - l_o)/l_o$, or it may be computed by some smoothing process from all the data as a whole.

The equation therefore gives the actual expansion of the rock in terms of unit of volume of solid rock at zero. If this be multiplied by the specific volume at zero, the absolute expansion is obtained.

An inspection of the equation shows that in the factor $\lambda_o - \lambda$, the micrometer value of the lengths λ is to be inserted in both cases, supposing the contour of meniscus to remain similar to itself; whereas in $l_o - \lambda_o$, the value of λ_o determined from bulk measurements of the space at the top of the cold tube is suitable, since the tube is squared off below.

With this it is interesting to compare the results to be obtained in case of a float. If A be the height of the column of magma; h the submerged depth of the cylindrical float or bucket with flat base; and if $\delta A = A_t - A_o$, $\delta h = h_t - h_o$, $\delta v = v_t - v_o$, etc., for the temperatures t and t_o respectively, then

$$(2) \dots \dots \dots (3 f t) + \frac{\delta H}{A - h} = \frac{\delta A - \delta h}{A_o - h_o} + 3 \frac{\delta l}{l_o} = \frac{\delta v}{v_o}$$

where δH is the rise of the float and l the length of the fusion tube. From this equation it appears at once that the float shortens the efficient length of the tube. Moreover, there is serious difficulty of properly determining A in this case. Hence, in view of the capillary and other errors encountered by a swimmer in a viscous liquid; the ease with which platinum at white heat welds with platinum vitiating the forms of both tube and swimmer; the tendency of air bubbles to accumulate around the latter and the probable utter failure of this method in indicating the passage from liquid to solid, induced me to prefer the other method. In case of a swimmer the observer does not surely know what he is measuring.

31. *Errors.*—First among these the lack of uniform temperature from the bottom to the top of the fusion tube may be mentioned. Moreover, only in the case of very slow changes of temperature is this quantity of like value from the axis to the circumference of the tube. I endeavored to meet these conditions. Moreover, since the temperature is actually measured at three points along a vertical, and the platinum tube is surrounded by the relatively nonconducting clay tube, I do not believe that serious discrepancy can here be apprehended. Specific inquiry will be made in the next paragraph in connection with the data obtained. Here I need only remark that it is unfortunate that the tube shows a tendency to be less hot at the top than at the bottom: for it is in the interest of thoroughly compact solidification that the tube cool from below upward. A column which cools first at the top is put into a state of dilatational strain after the manner of a Rupert drop, so that vacuities are left within the mass and the solidification contraction is

obtained too small in value. I think a remedy for the difficulty in question will be found by feeding the upper burner from an independent gas supply.

Indeed I have frequently noted lateral funnel-shaped holes several millimeters in diameter and as much as 1 centimeter or more deep, terminating in the smooth surface of the meniscus. It is also possible that bubbles congregate under the surface of the molten magma, without breaking through it, giving rise to these cavities in the cold column. I have already stated that the ejection of gases on solidification is of very common occurrence.

At very high temperatures (say above $1,500^{\circ}$) I found the meniscus to gradually sink in depth even when temperature remained constant or rose in value, § 33. This may be due to the escape of bubbles in the thin liquid, or it may also be due to the fact that the tube is now insufficiently rigid to withstand the pressure of a column of molten rock 25 centimeters high. Examples will be given below, from which it appears that the meniscus, *caet. par.*, does actually sink from day to day conformably with changes of length of the platinum tube. I suspect, therefore, that the clay tube which envelopes the fusion tube, besides acting favorably as a nonconductor, contributes to the high temperature rigidity of the system. After several heatings the platinum tube can no longer be removed from the clay tube, into which it now fits tightly, without breaking the latter.

It has been assumed that the meniscus remains similar in form at all temperatures. This can only be partially true. The fused rock wets platinum so thoroughly, however, that convex forms of meniscus need never be apprehended. Indeed there is a tendency to flow or creep into crevices. After solidification, however, the meniscus is apt to be drawn down so as to be relatively deep near its center. Here is, therefore, an error which counteracts the tendency to dilatational strain. It is almost futile to make allowance for these discrepancies, but the micrometrically measured depth of the solid meniscus may be as much as .2 centimeter or .3 centimeter deeper than the mean surface computed from bulk.

Although too much reliance must, therefore, not be placed on the behavior of the solid state, yet the values are redeemed from the character of mere estimate, because the expansion of the platinum and its solid glass core are so nearly alike. This is a particularly fortunate chance, whereby the strains imposed on both the metal and the glass during cooling do not probably exceed the limits of elasticity of either. (§§ 33, 34 35.) From all of this it follows that the cooling of the furnace must take place so slowly as to give the viscous content of the fusion tube full time to adjust itself free from strain. Particularly are these precautions necessary near the solidifying point. In such a case experiment shows that the platinum tube is not dragged along appreciably by the solidifying magma, and the results retain a degree of trust.

worthiness much beyond what was to be anticipated, even in the solid state. At the same time dilatational strain is reduced to a minimum. In how far this has been accomplished satisfactorily can always be seen in the degree of uniform contraction of the platinum tube.

Another serious consideration is the allowance to be made for the expansion of the platinum probe dd of the vertical micrometer. The expansion as estimated above is too small, for it is not merely the amount by which the probe is lowered that is subject to expansion, but a considerable length of metal above the furnace passes from a lower to a higher temperature. Consecutive values for the depth of the meniscus will thus differ appreciably, the later ones being larger as a rule than the earlier ones. I hope, however, in the future to obtain an estimate of this discrepancy by measuring an amount of thrust through the sight tube with the cathetometer, and comparing this value with the corresponding value to be read off on the vertical micrometer. I have thought of making the micrometer screw hollow and providing it with an internal circulation of water; but this would be difficult to accomplish.

RESULTS.

32. *Arrangement of the tables.*—In the following tables l_0 and r_0 denote the length and radius of the cold platinum fusion tube, and λ'_0 the bulk value (water measurement) of the mean depth of the meniscus, the measurement being made on the day after the fusion experiments. The temperatures at the bottom, middle, and top of the fusion tube are given under θ_1 , θ_2 , θ_3 , respectively, and θ is their mean value, observed at the time given. For each value of θ two data for the expansion of the rock, the volume expansion of the tube, and the actual expansion $\delta V/V_0$ of the rock are given, and they were obtained before and after the temperature measurement. Here $V-V_0$ is abbreviated δV and V_0 is the volume of the solid rock at zero. The data enclosed in parentheses show that in this case the value applied for the expansion of the tube is obtained as a mean result of all the measurements made. Otherwise the value directly observed was applied.

33. *Contraction of diabase. Tables.*—The results of my first series, being of inferior accuracy, will be omitted. Table 12 contains the results for the second series of experiments made on October 18, 1891. Here, too, the precaution of alternating volume measurements with the temperature measurements was not yet applied and the values given are less nearly coincident.

TABLE 12.—*Contraction of diabase. Second series.*

$l_0=25.49\text{cm}; \lambda_0=.86\text{cm}; r_0=.75\text{cm}$

θ_1 θ_2 θ_3	Mean. θ	Apparent volume ex- pansion of the rock.	Volume expansion of the tube.	$\delta V/V_0$	Mean. $\delta V/V_0$	Time.	Remarks.
$^{\circ}C$	$^{\circ}C$					Minutes.	
1513	1514	.0442	.0411	-----	.0853	0	Liquid. Viscous ex- tension of tube?
1536	-----	.0431	-----	-----	.0842	-----	
1492	-----	.0421	-----	-----	.0832	-----	
1538	1544	.0379	.0399	-----	.0778	25	Liquid.
1566	-----	.0374	-----	-----	.0773	-----	
1528	-----	.0369	-----	-----	.0768	-----	
1451	1480	.0345	.0378	-----	.0721	50	Liquid.
1475	-----	.0343	-----	-----	-----	-----	
1515	-----	.0342	-----	-----	-----	-----	
1204	1202	.0302	.0300	-----	.0602	75	Solidifying, chilled exteriorly.
1194	-----	.0304	(.0290)	-----	.0594	-----	
1208	-----	.0302	.0282	-----	.0584	-----	
896	872	.0074	.0201	-----	.0275	100	Chilled solid.
864	-----	.0050	(.0183)	-----	.0233	-----	
855	-----	.0025	.0165	-----	.0188	-----	
804	770	.0016	.0141	-----	.0157	130	Solid.
724	-----	-----	.0130	-----	.0146	-----	
783	-----	-----	.0120	-----	.0138	-----	
	20	.0000	.0000	-----	.0000	Next day	Cold.

Taking each of the three values of $\delta V/V_0$ at 1514° , 1544° , 1480° , it is seen that the members of each set successively become more coincident. Moreover, the sweep downward and to the right of the means of the individual values of $\delta V/V_0$ is such as to indicate either that the tube sagged viscously or that the magma ejected bubbles or changed the figure of its meniscus. It seems to me that the platinum tube underwent stretching until it was finally restrained by the clay tube enveloping it. Rejecting the first datum, the mean volume expansion of the liquid is .000050 per degree, a value which agrees very well with the subsequent work.

The passage from 1202° to 872° is abrupt, indicating that a melting point has been passed. Moreover, the wide divergence of the three data for $\delta V/V_0$ at 872° , shows that the cooling took place far too rapidly, so that the temperature of the rock must have been much higher than the thermocouples indicate. Finally the mean volume expansion of the solid magma below 872° is about .000020 per degree, a value which also agrees very well with the work below.

If the solidifying point of the magma be 1095° (the value found in §§ 34, 35) then the contraction on solidifying may be estimated at 3 per cent. Thus it follows with certainty that diabase contracts on solidification and that its fusion behavior must be of a thoroughly normal type.

The amount of solidification contraction is, however, too small if too rapid cooling actually produces a strain of dilatation. For the same reason the values of $\delta V/V_0$ for the liquid state, though correct in their relations to each other, must be uniformly too small, for the factor V_0 used is too large. All this is proved directly by the next two tables, but it may be inferred here from the contraction curve of the platinum tube. This shows reasonable uniformity of contraction as far as 900° , after which, however, there is a break to much smaller rates of con-

traction, showing I think that the platinum tube has been dragged along by the too rapidly solidifying magma.

34. *Contraction of diabase. Tables and chart.*—The data of my third series of experiments, made on October 20, 1891, are given in table 13. The precautions for slow cooling were fully taken, and the solidification point is now sharply apparent.

TABLE 13.—*Contraction of diabase. Third series.*

$l_0 = 25.466\text{cm}; \lambda_0 = 1.424\text{cm}; r_0 = .75\text{cm}.$

θ_1 θ_2 θ_3	Mean. θ	Apparent volume ex- pansion of rock.	Volume ex- pansion of the tube.	$\delta V_1/V_0$ $\delta V_2/V_0$	Mean. $\delta V/V_0$	Time.	Remarks.
$^{\circ}\text{C}.$	$^{\circ}\text{C}.$					<i>Minutes.</i>	
1360	1386	.0452	.0358	.0810	.0811	0	Liquid.
1396	-----	.0454	(.0356)	.0812	(.0809)	-----	
1403	-----	-----	-----	(.0808)	-----	-----	
				(.0810)	-----	-----	
1286	1300	.0437	.0340	.0777	.0778	23	Liquid.
1304	-----	.0438	(.0334)	.0778	(.0772)	-----	
1311	-----	-----	-----	(.0771)	-----	-----	
				(.0772)	-----	-----	
1163	1166	.0406	.0297	.0703	.0704	53	Sticky.
1167	-----	.0409	(.0300)	.0706	(.0707)	-----	
1168	-----	-----	-----	(.0706)	-----	-----	
				(.0709)	-----	-----	
1097	1093	.0376	.0270	.0646	.0646	86	Very sticky.
1093	-----	.0333	(.0281)	.0603	-----	-----	To be drawn out in
							threads.
1089	-----	-----	-----	(.0657)	(.0657)	-----	Solidifying gradu-
							ally.
				(.0614)	-----	-----	
1102	1095	.0014	.0273	.0288	.0287	111	Solid.
1095	-----	.0013	(.0282)	.0286	(.0296)	-----	
1088	-----	-----	-----	(.0296)	-----	-----	
				(.0295)	-----	-----	
929	896	.0000	.0211	.0211	.0212	157	Solid.
897	-----	.0002	-----	.0213	-----	-----	
863	-----	-----	-----	-----	-----	-----	
461	468	— .0004	.0081	.0077	.0079	185	Solid.
433	-----	$\pm$.0000	-----	.0081	-----	-----	
510	-----	-----	-----	-----	-----	-----	
	20	.0000	.0000	.0000	.0000	Next day.	Cold.

Rock, mean actual expansion, solid, 0° — 1000°, .0000250.
Rock, mean actual expansion, liquid, 1100° — 1500°, .0000470.
Rock, expansion on fusion (1095°), .0390.
Rock, mean apparent expansion, solid, 0° — 1000°, .0000007.
Rock, mean apparent expansion, liquid, 1100° — 1500°, .0000205.
Tube, mean expansion below 1000°, .0000240.
Tube, mean expansion above 1100°, .0000265.

These values are fully represented in the chart, Plate V, where the actual expansion is given by the heavy curve *dcbef*, the ordinates being the volume increments and the abscissæ temperatures. The apparent expansion of the rock is shown by the light curve *lk gh*, the ordinates of the solid contour *lk* being nearly zero, so that the tube and contents expand nearly at the same rate, whereas the liquid contour *gh* follows with a marked jump and shows great uniformity. Finally the expansion of the platinum tube is represented by the dotted curve *dc a i*. The exceedingly small break at *a*, which indicates the amount of drag or shortening of the length of the platinum tube by the solidifying rock, shows how well the operation of cooling has here been conducted, and proves the results to be trustworthy throughout.

One of the important results obtained from the chart is the occurrence of a sharply-defined solidifying point at 1093°. Here, therefore, is a

method by which this point of the rock can be defined free from non-intrinsic tests.

Finally, it may be noted that so long as the magma is liquid, the distribution of temperature along the fusion tube is fairly constant, and and is usually hotter at the top. After this the discrepancy increases, probably from lack of convective conduction of the solid magma.

35. *Contraction of diabase. Tables and chart.*—The data of my last series of experiments, made on October 21, 1891, with all precautions necessary, are given in Table 14. Two complete sets of result for each step of temperature are given.

TABLE 14.—*Contraction of diabase. Fourth series.*

$$l_0 = 25.447\text{cm}; \lambda^1_0 = 1.220\text{cm}; r_0 = .75\text{cm}$$

θ_1 θ_2 θ_3	Mean. θ	Apparent volume ex- pansion of rock.	Volume ex- pansion of the tube.	$\delta V_1 / V_0$ $\delta V_2 / V_0$	Mean. $\delta V / V_0$	Time.	Remarks.
C°.	°C.	—	—	—	—	Minutes.	
1374	1388	.0403	.0357	.0760	.0760	5	Liquid.
1394	.....	.0404	(.0356)	.0761	(.0760)	.....	
1395	.....	.....	.....	(.0759)	.....	.....	
1415	1421	.0407	.0362	.0768	.0770	20	Liquid.
1431	.....	.0409	(.0364)	.0771	(.0771)	.....	
1417	.....	.....	.....	(.0771)	.....	.....	
1318	1319	.0394	.0341	.0734	.0731	50	Liquid.
1324	.....	.0387	(.0339)	.0727	(.0730)	.....	
1315	.....	.....	.....	(.0733)	.....	.....	
1304	1305	.0383	.0350	.0733	.0736	65	Liquid.
1308	.....	.0390	(.0335)	.0740	(.0721)	.....	
1304	.....	.....	.....	(.0718)	.....	.....	
1204	1190	.0357	.0316	.0673	.0672	90	Sticky.
1189	.....	.0355	(.0305)	.0671	(.0661)	.....	
1176	.....	.....	.....	(.0662)	.....	.....	
1177	1163	.0355	.0299	.0655	.0652	105	Very sticky.
1158	.....	.0349	(.0299)	.0649	(.0652)	.....	To be drawn out in threads.
1153	.....	.....	.....	(.0655)	.....	.....	
1138	1112	.0339	.0286	.0625	.0628	128	Top encrusted.
1109	.....	.0344	(.0286)	.0630	(.0628)	.....	
1090	.....	.....	.....	(.0625)	.....	.....	
1117	1092	.0200	.0275	.0475	.0475	151	Solidifying.
1088	.....	.0155	(.0280)	.0430	(.0480)	.....	
1072	.....	.0091	.....	.0366	.....	.....	
1109	1092	.0032	.0282	.0315	.0287	175	Solidifying.
1081	.....	.0005	(.0280)	.0287	(.0285)	.....	
1086	.....	.....	.....	(.0313)	.....	.....	
946	914	.0013	.0213	.0226	.0223	198	Solid.
903	.....	.0006	.....	.220	.....	.....	
893	.....	.....	.....	.....	.....	.....	
900	855	.0003	.0199	.0202	.0202	210	Solid.
827	.....	.0003	.....	.202	.....	.....	
837	.....	.....	.....	.....	.....	.....	
20	.....	.0000	.0000	.0000	.0000	Next day.	Cold.

Rock, mean actual expansion, solid, 0°—1000°, .0000250.

Rock, mean actual expansion, liquid, 1100°—1500°, .0000468.

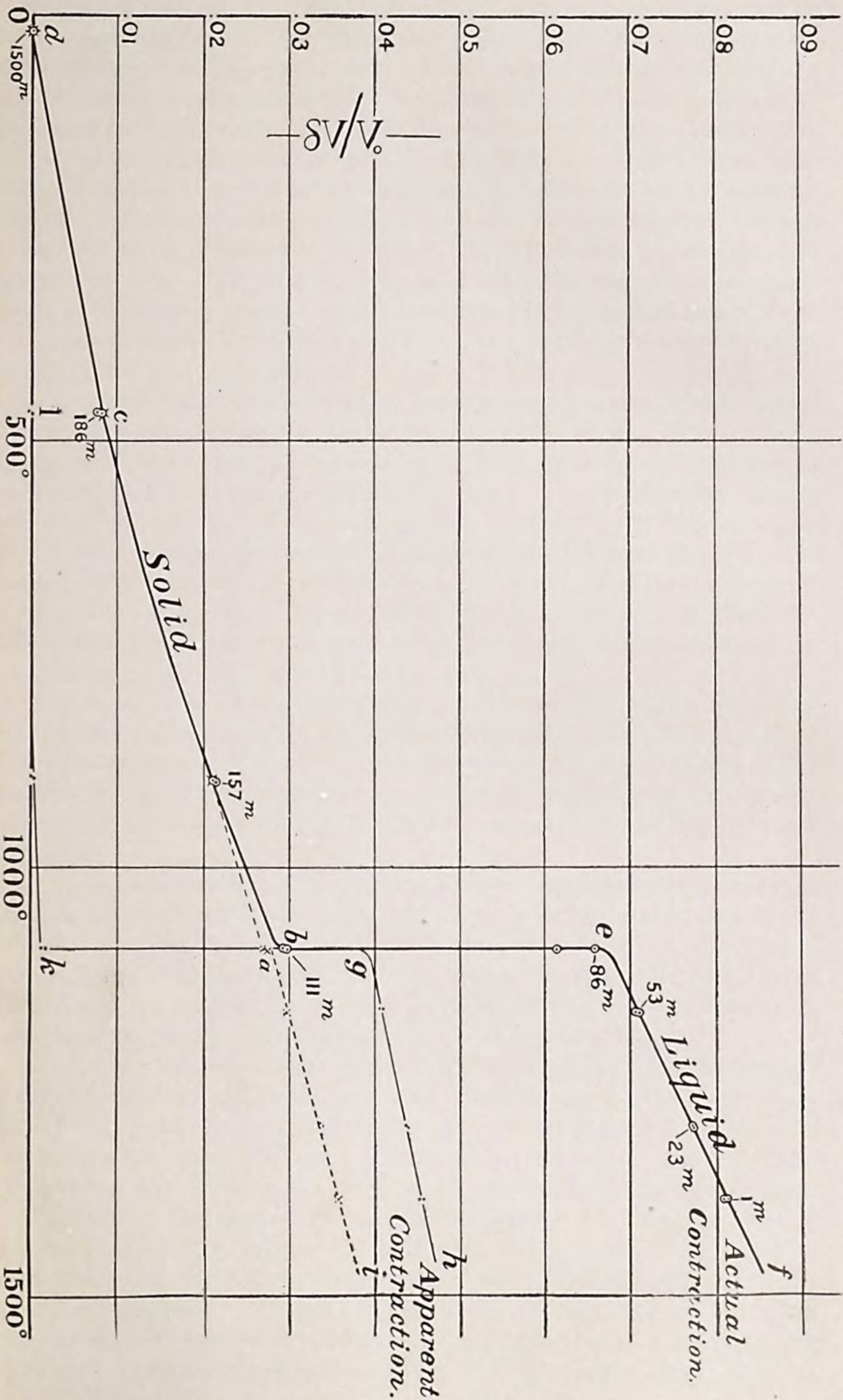
Rock, mean apparent expansion, solid, 0°—1000°, .0000005.

Rock, mean apparent expansion, liquid, 1100°—1500°, .0000218.

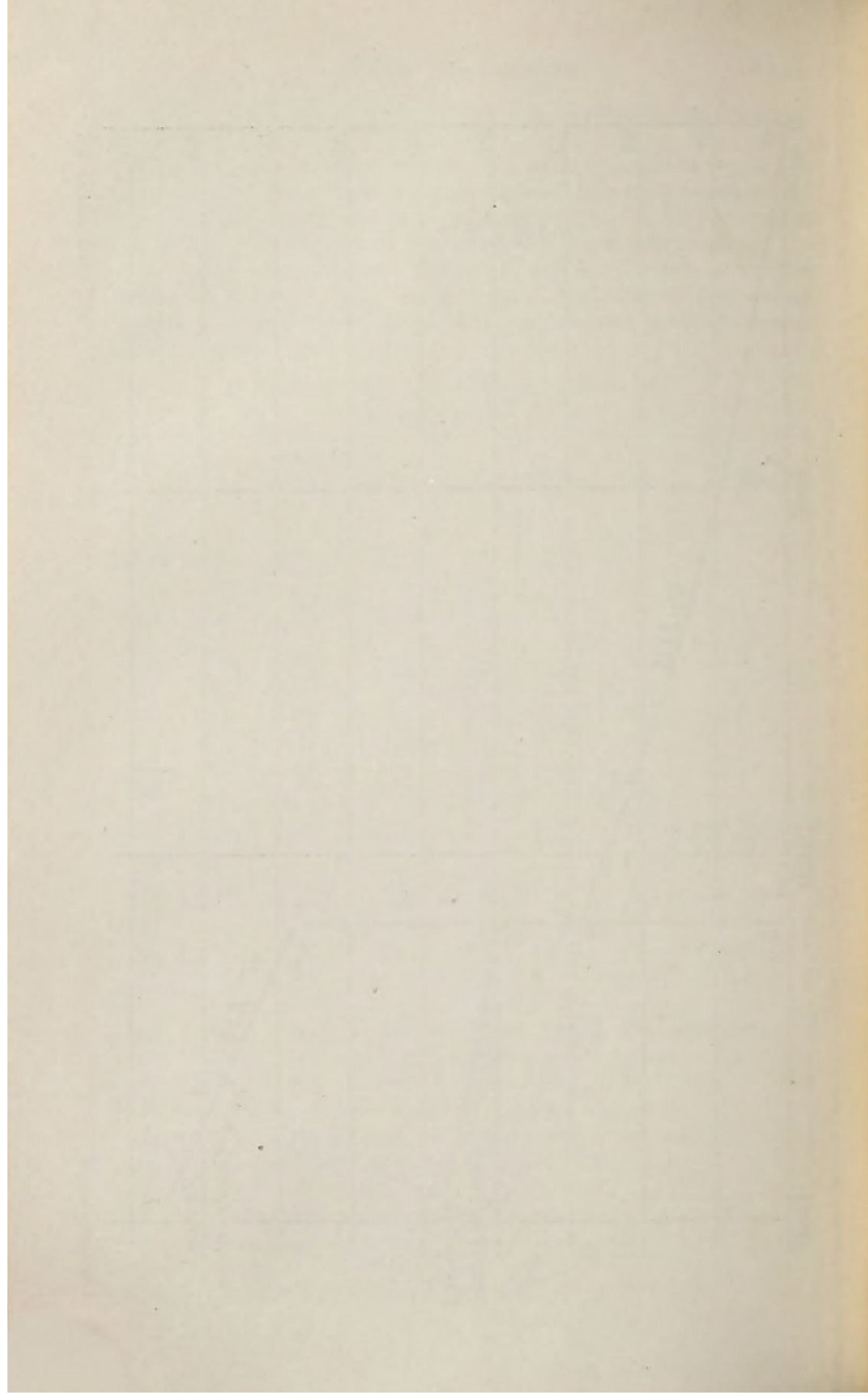
Tube, mean expansion below 1000°, .0000235.

Tube, mean expansion above 1100°, .0000260.

Rock, expansion on fusion, (1093°), .0340.



CONTRACTION OF MOLTEN DIABASE, CONTINUOUSLY FROM LIQUID TO SOLID.



These data are given in the chart, Pl. VI, Fig. 1, on the same plan as in the preceding case. The inferences to be derived are identical with those of the preceding paragraph. The sudden contraction of the rock on solidifying is of smaller value here, but this is to some extent compensated by the greater longitudinal compression of the fusion tube, as shown at *a* in the curve *ca i*. It is interesting to note that in both series 3 and 4 the first length measurement of the tube at the solidifying point of its contents, is smaller than the second, showing the end thrust to have diminished in value, while the tube has recuperated from its strain. It is also well to note that the sag of tube, as expressed in the cold lengths 25.49 centimeters in the second series, 25.47 centimeters in the third series, and 25.45 centimeters in the fourth series is small, but quite appreciable.

Regarding the differences of λ_0 (micrometric), and λ'_0 (bulk measurement), which is .34 centimeter in the fourth series, .13 centimeter in the third series, and .38 centimeter in the second series, the remarks made in § 31 apply. Hence the third series is the one in which cooling was slowest, and in this the solidification contraction is largest. Lateral fissures opening into the solid meniscus were present in both these cases. Regarding the depth λ , of the solid meniscus at the outset, and at about the same temperature, 1387°, I found $\lambda = .50$ centimeter in the third series, and $\lambda = .62$ centimeter in the fourth series, showing enlargement of the volume of the fusion tube.

Finally, as before, temperatures are hotter at the top or fairly uniform so long as the magma within the fusion tube is very liquid. Near the solidifying point, however, and thereafter, the top is colder. For this reason, since solidification commenced at the top, the data of this paragraph show a smaller solidification contraction than in the last instance.

36. General remarks.—The charts show how important it is to measure the expansion of the fusion tube, which, if neglected, would distort the liquid expansion fully 50 per cent. Moreover I have no doubt that when fusion is made in clay crucibles which are apt to become friable after heating, the clay on cooling is quite at the mercy of the more tenacious slag within, and changes its volume accordingly.

Again even in case of slow cooling solid contraction tends to express itself as a dilatational strain, and if gas bubbles are ejected by rocks on solidifying solid volumes will be found too large and the solid contractions, etc., too small. Hence I place greatest reliance in the solidification contraction given in the third series, the value being 3.9 per cent.

Naturally, I also made special experiments on the floating of solid rocks on the molten magma, cf. § 20. To my surprise such flotation always occurs, notwithstanding the fact that originally the cold rock must be 8 per cent + 10 per cent more dense than the molten rock, since it is both solid and cold as well as possessed of organized rock structure. It soon appeared, however, that the cause of such flotation

is crudely mechanical, since the rock in virtue of its weight simultaneously hollows out a cavity and chills it, thus forming a little solid boat in which it floats on the very viscous slag below. This is shown in Plate VI, Fig. 2, where *a* is the body of rock, *AA* the molten magma, and *bb* the solidified bowl-shaped skin. It may be observed that flotation is assisted by viscous friction of the blanket *bb* on the magma *AA* which supports the blanket and keeps it distended. I then attempted to make Niess and Winkelmann's "Fundamental-versuch" by submerging the rock; but here both on account of the intense white glare of the furnace and the tendency to chill at the surface of the magma during the operation I was not able to reach any definite point of view.

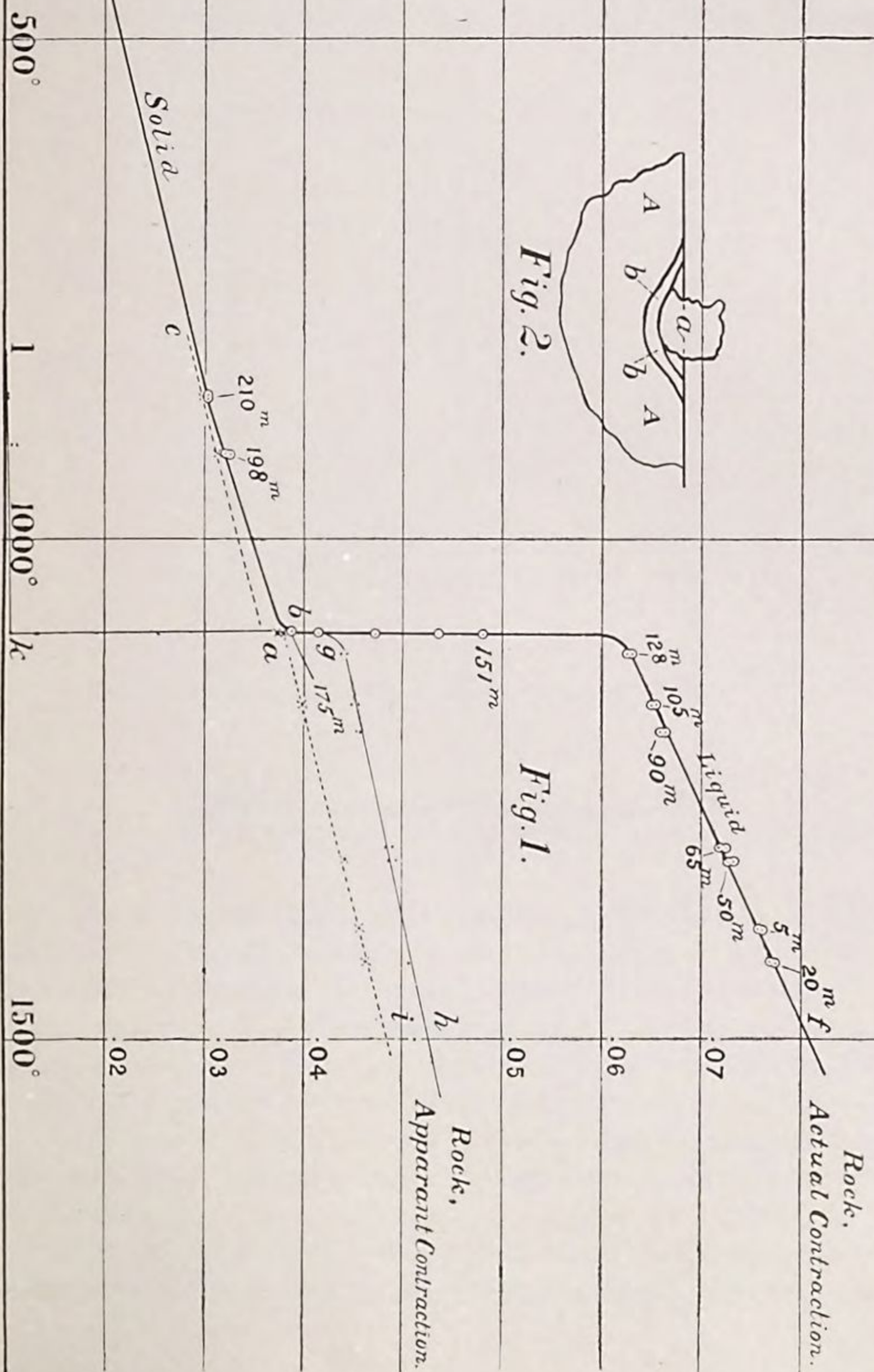
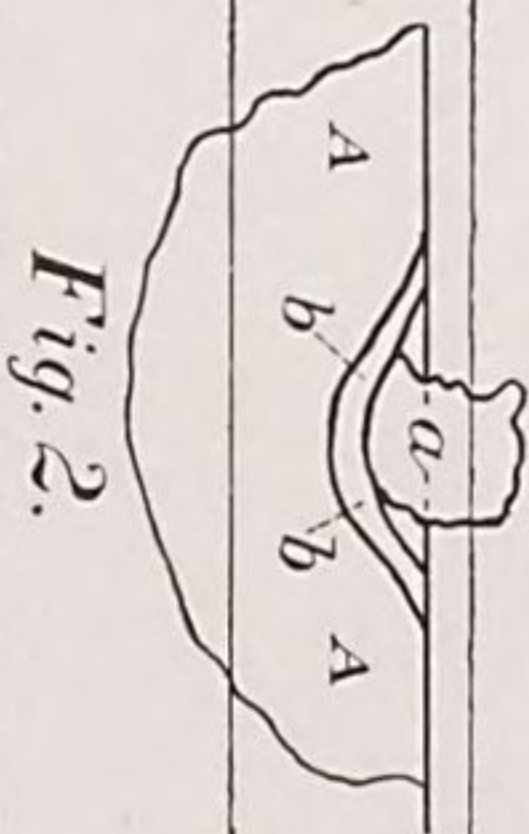
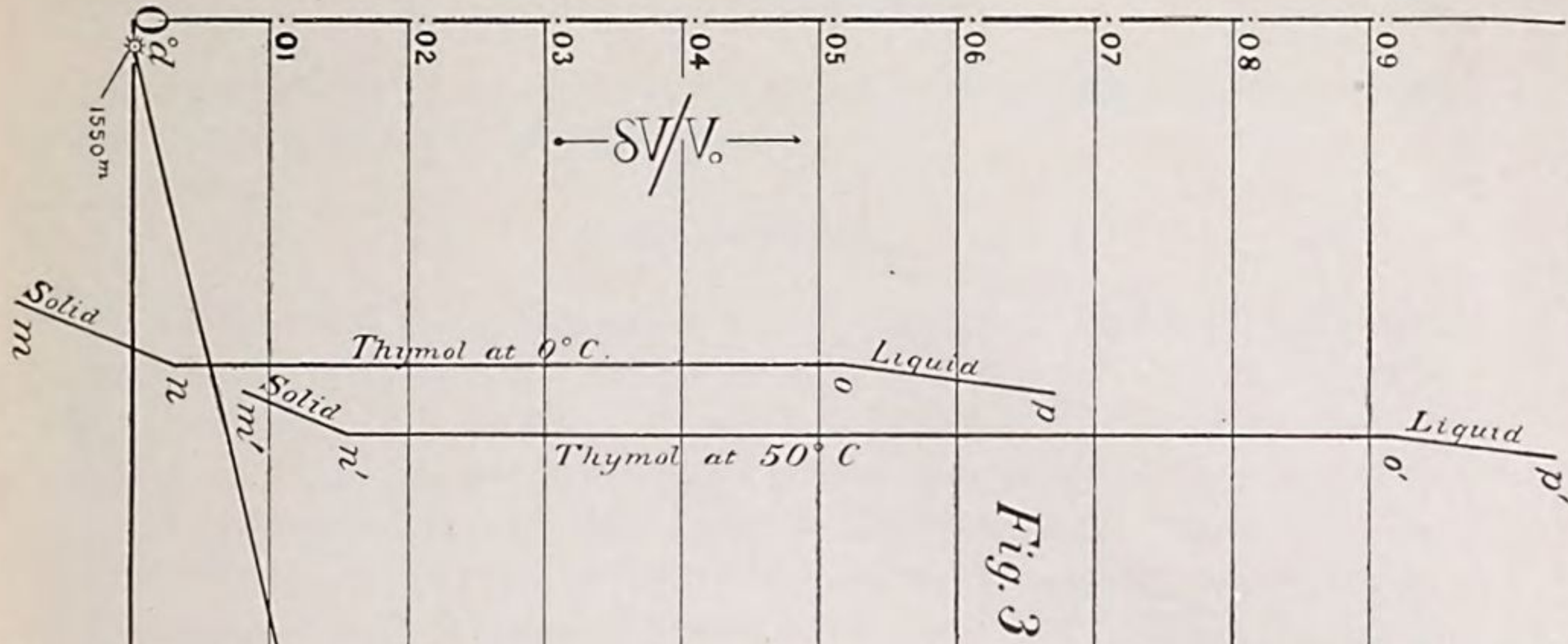
Results for thymol are given in Plate VI, Fig. 3, for comparison. § 38.

37. *Fusion and solidification alternating.*—To corroborate the above work, I made some experiments by measuring the expansion on fusion, as well as the contraction on solidification. These are contained in Table 15, where the notation is the same as above. The zero lengths (l_0 , λ_0 , etc.), were taken from the above work, as was also the expansion of platinum.

TABLE 15.—*Fusion and solidification alternating.*

Time.	θ_1 θ_2 θ_3	Mean θ	$(\delta v/v_0)$ $\times 10^4$	Time.	θ_1 θ_2 θ_3	Mean θ	$(\delta v/v_0)$ $\times 10^4$
<i>Minutes.</i>	°	°		<i>Minutes.</i>	°	°	
20	1139	1158	332	195	1059	1086	302
	1163	-----	343		1086	-----	300
	1173	-----			1113	-----	
45	1235	1239	511	225	1097	1067	274
	1246	-----	614		1066	-----	271
	1234	-----			1039	-----	
70	1254	1265	664	240	1167	1183	338
	1275	-----	671		1190	-----	373
	1266	-----			1192	-----	
95	1285	1286	678	260	1239	1239	538
	1294	-----	681		1246	-----	595
	1280	-----			1232	-----	
127	1157	1174	604	280	1087	1113	328
	1176	-----	591		1115	-----	302
	1188	-----			1138	-----	
165	1146	1134	425				
	1125	-----	404				
	1132	-----					

The difficulty with these experiments lies in the insufficient time allowed for fusion and solidification (§§ 33–37). In the former case irregularities are unavoidable, since it is impossible to heat a solid rod of rock uniformly throughout its length. The high solidifying point, here, probably follows from the fact that the fusion was not complete. This is seen in Fig. 3, where the individual data are marked by numerals indicating the time at which the observation was made, and where the first cycle is indicated by a heavy line, the second by a light line. I suspect, therefore, that in rocks melting and solidifying points are different and may be 100° apart. Hence the large contraction at a definite degree of temperature observed above, was due to very slow cooling of an undercooled mass.



CONTRACTION OF MOLTEN DIABASE, CONTINUOUSLY FROM LIQUID TO SOLID.

is crudely mechanical, since the rock in virtue of its weight simultaneously hollows out a cavity and chills it, thus forming a little solid boat in which it floats on the very viscous slag below. This is shown in Plate VI, Fig. 2, where *a* is the body of rock, *AA* the molten magma, and *bb* the solidified bowl-shaped skin. It may be observed that flotation is assisted by viscous friction of the blanket *bb* on the magma *AA* which supports the blanket and keeps it distended. I then attempted to make Niess and Winkelmann's "Fundamental-versuch" by submerging the rock; but here both on account of the intense white glare of the furnace and the tendency to chill at the surface of the magma during the operation I was not able to reach any definite point of view.

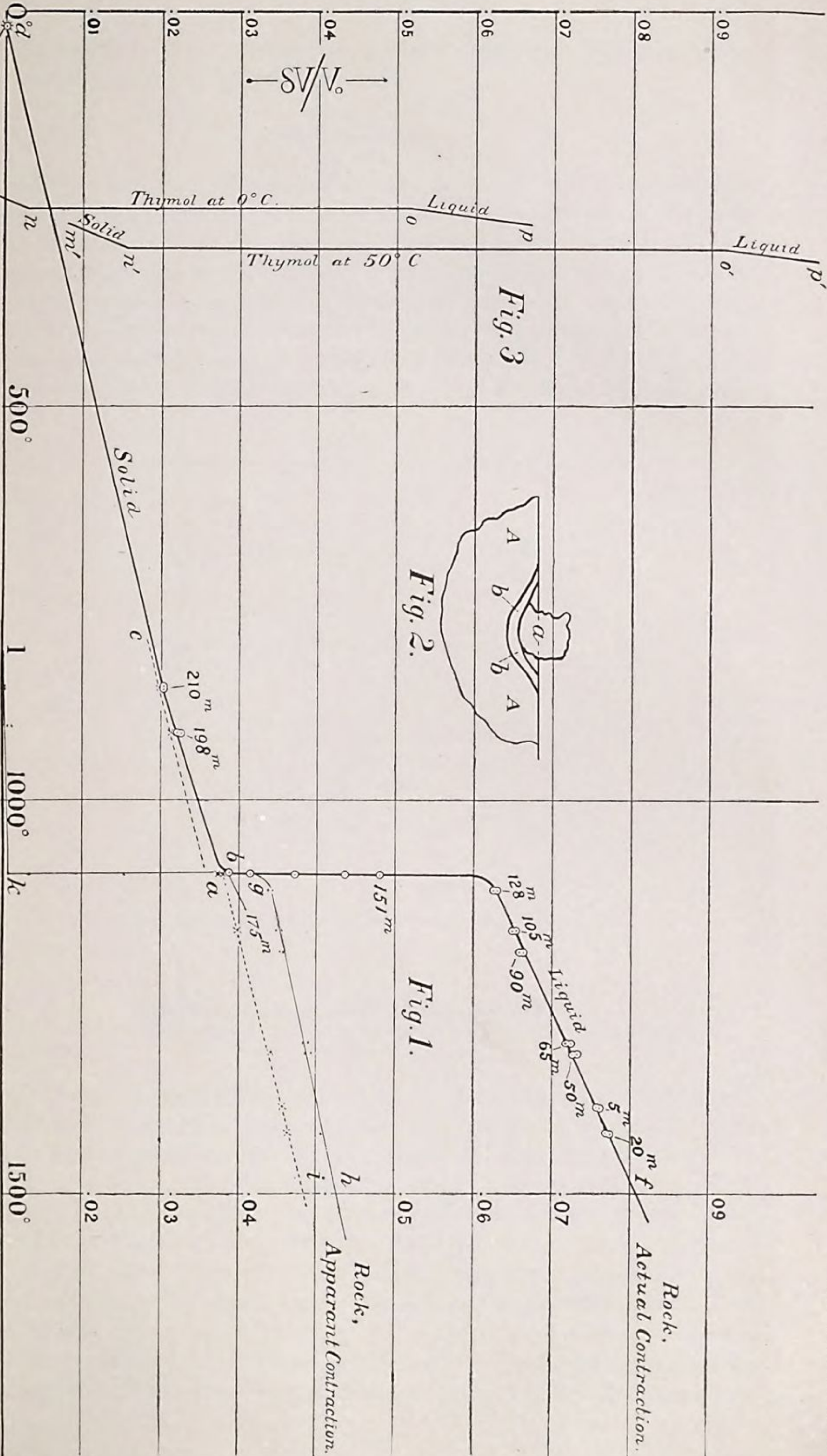
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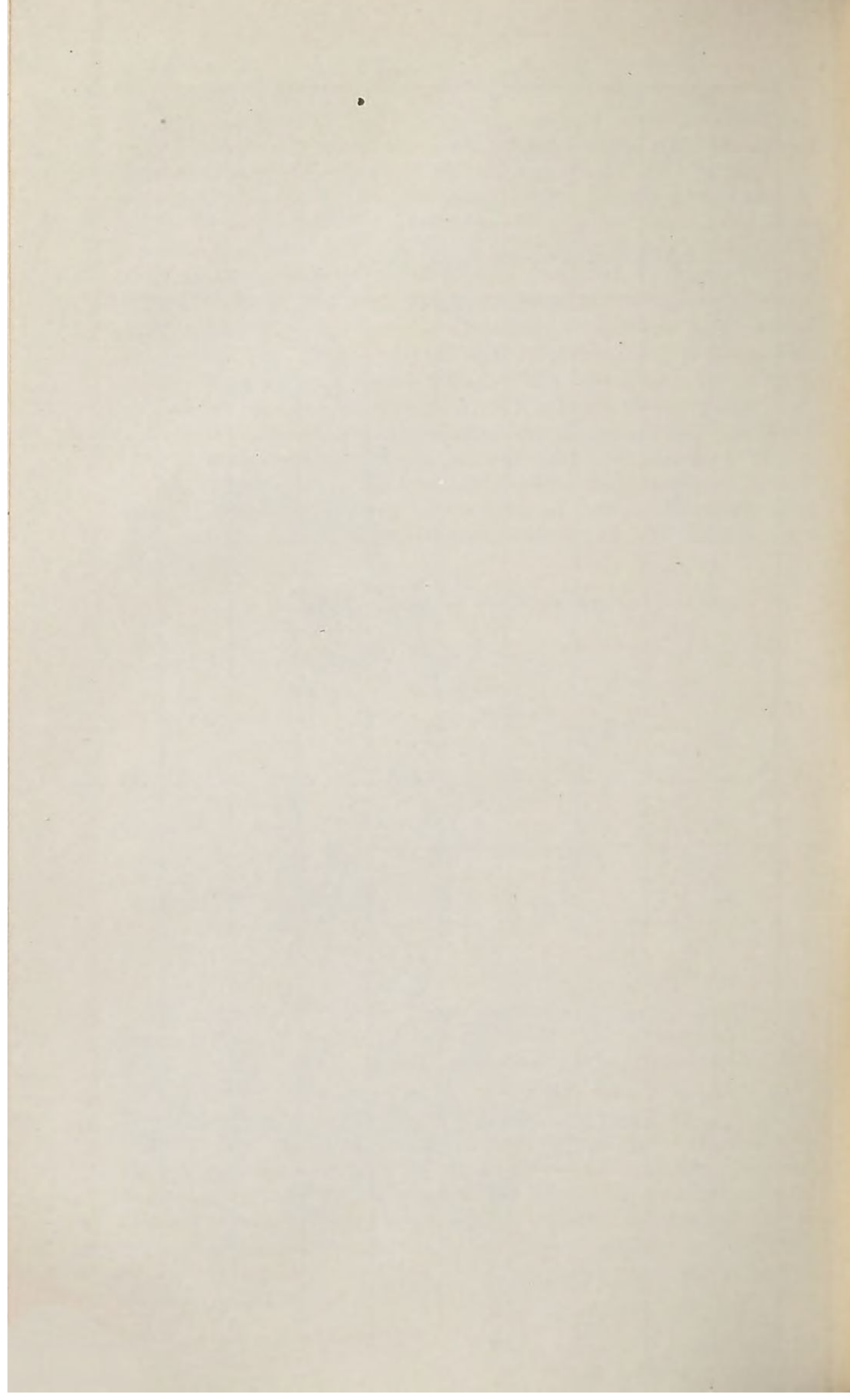
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Time.	θ_1 θ_2 θ_3	Mean θ	$(\delta v/v_0)$ $\times 10^4$	Time.	θ_1 θ_2 θ_3	Mean θ	$(\delta v/v_0)$ $\times 10^4$
<i>Minutes.</i>	°	°		<i>Minutes.</i>	°	°	
20	1139	1158	332	195	1059	1086	302
	1163	-----	343		1086	-----	300
	1173	-----			1113	-----	
45	1235	1239	511	225	1097	1067	274
	1246	-----	614		1066	-----	271
	1234	-----			1039	-----	
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	1275	-----	671		1190	-----	373
	1266	-----			1192	-----	
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	1188	-----			1138	-----	
165	1146	1134	425				
	1125	-----	404				
	1132	-----					

The difficulty with these experiments lies in the insufficient time allowed for fusion and solidification (§§33–37). In the former case irregularities are unavoidable, since it is impossible to heat a solid rod of rock uniformly throughout its length. The high solidifying point, here, probably follows from the fact that the fusion was not complete. This is seen in Fig. 3, where the individual data are marked by numerals indicating the time at which the observation was made, and where the first cycle is indicated by a heavy line, the second by a light line. I suspect, therefore, that in rocks melting and solidifying points are different and may be 100° apart. Hence the large contraction at a definite degree of temperature observed above, was due to very slow cooling of an undercooled mass.



CONTRACTION OF MOLTEN DIABASE, CONTINUOUSLY FROM LIQUID TO SOLID.



The amount of volume contraction agrees in both cases with the above data, and this is the chief point at issue.

INFERENCES.

38. *Comparison with thymol.*—Since the fusion of rocks like diabase is thus thoroughly normal, it follows that melting point must increase with pressure. It is well to examine tentatively into the nature of this relation, and for this purpose I have drawn certain unpublished results of mine for thymol, on the same scale used for the rock. In Pl. VI, Fig. 3, $m'n'o'p'$ shows the contraction of thymol at its melting point, where the substance is liquid along $o'p'$ and solid along $m'n'$. Similarly, $mnop$ shows the contraction of thymol at 0°C . These results indicate that

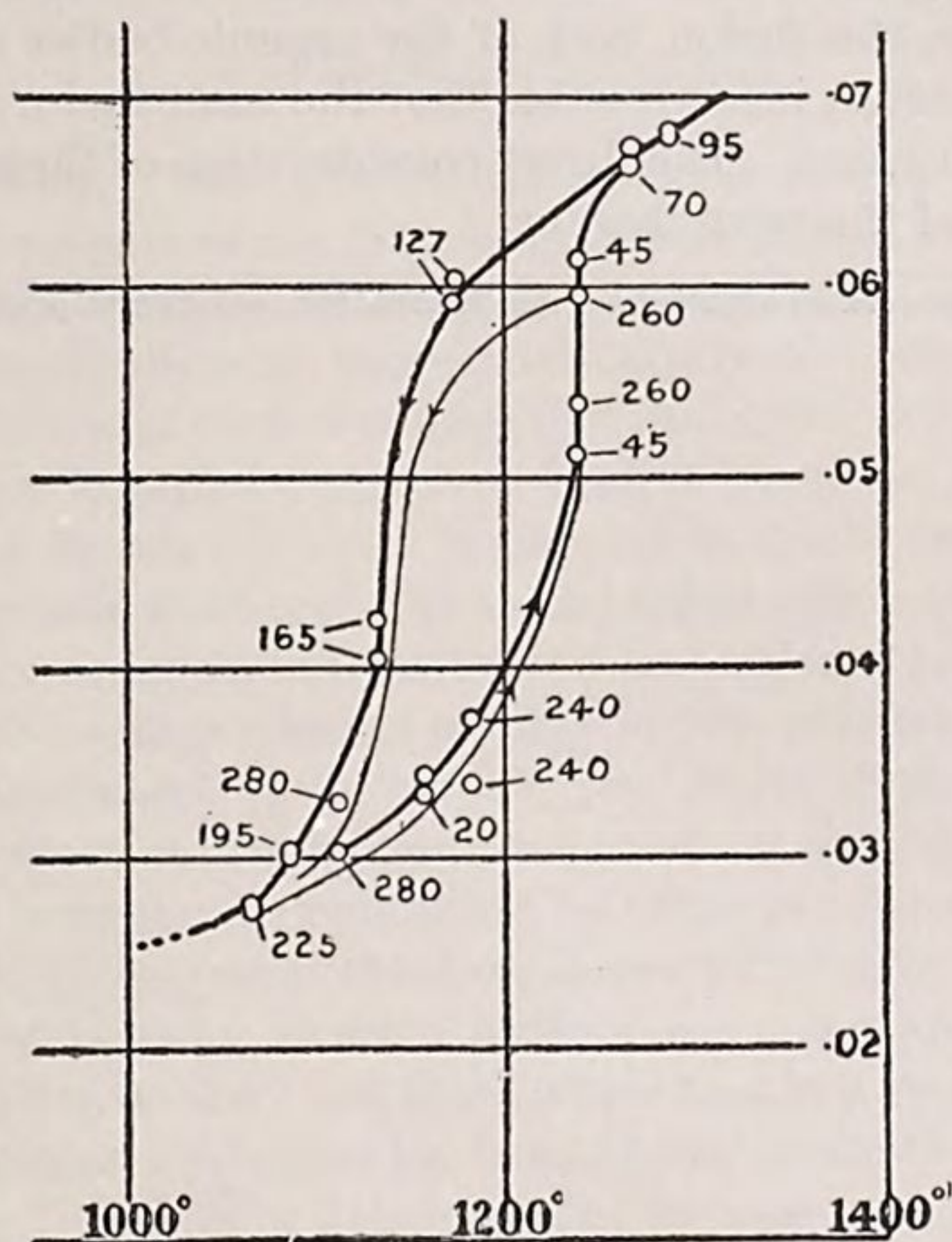


FIG. 3.—Cyclic volume changes produced by alternate fusion and solidification of rock magma (diabase).

the solidification contraction decreases in proportion as the thermal expansion ($[\delta(V/V_0)/d\theta]_0$ where θ denotes temperature) decreases. The solidification contraction of thymol, therefore, like its coefficients of expansion, is larger than the similar variable in the case of rock. The relations are such that if liquid thymol could be cooled down to -25° it would then show the same solidification contraction as the silicate.

39. *Lower critical temperature.*—Analogously the compressibility of the rock will show decidedly larger values than in organic bodies; and hence it also follows that whereas the lower critical pressure liquid-solid of naphthalene, for instance, should, according to my experiments, lie somewhere in the region of 10,000 atmospheres, the corresponding

pressure in the case of rock magma must be indefinitely higher. In other words, the consecutive isopiestic of the magma must lie very much nearer together than the corresponding isopiestic of naphthalene, supposing the pressure to vary in like steps in both cases.

40. *Melting point and pressure.*—From this, however, it does not by any means follow that the relation of melting point to pressure will be different in the silicate and in the carbon compound. In the latter case, data for normal fusions are available in case of wax, paraffin, spermaceti, and naphthalene, and for these dT/dp , the relation of melting point to pressure, lies within the narrow margin of $\cdot 020$ to $\cdot 036$, data moreover which even for the same substance¹ are subject to variation. Thus I found that in naphthalene dT/dp varied from $\cdot 027$ to $\cdot 035$, according as melting points or solidifying points were suitably considered. Since, therefore, the fusion both of the organic bodies and the silicate is alike in character, it is probable that the same factor dT/dp will correspond to both cases. The direct consideration of these questions will be the subject of the next chapter.

¹ See my work on naphthalene, *Am. Journal Sci.*, vol. 42, 1891, p. 144 et seq.

CHAPTER III.

THE THERMAL CAPACITY OF IGNEOUS ROCK, CONSIDERED IN ITS BEARING ON THE RELATION OF MELTING POINT TO PRESSURE.¹

PRELIMINARY REMARKS.

41. *Introductory.*—The present experiments are in series with the volume measurements of my last chapter, and the same typical diabase, § 18, was operated upon. Since it is my chief purpose to study the fusion behavior of silicates, more particularly the relation of melting point to pressure, the observations (700° to 1400°) are restricted to an interval of a few hundred degrees on both sides of the region of fusion. The solid locus found, however, is one which would be nicely tangent to an initial specific heat of about .2, the value which probably obtains. The liquid locus is again indicative of a transitional temperature.²

42. *Literature.*—Experiments similar to the present, but made with basalt, were published quite recently by Profs. Roberts-Austen and Rücker.³ In view of the normal behavior occurring throughout my own data, the irregularities obtained by these gentlemen in case of different methods of treatment (heating in an oxidizing or reducing atmosphere, repeated heating, sudden cooling, etc.), the anomalously large specific heat between 750° and 880° , where basalt is certainly solid, and the absence of true evidences for latent heat⁴ make their results somewhat startling. Basalt is lithologically so near akin to diabase that one would anticipate a close physical similarity in the two cases. Unfortunately, the account given of the work with basalt is meager, and detailed comparisons are therefore impossible. I will only state that as nobody had then compared the platinum-rhodium couple with the air thermometer, I should not have regarded a standardization by means of a single melting point sufficient.

¹Cf. Am. Journal Sci., vol. 43, 1892, pp. 56, 57.

²Am. Journal Sci., vol. 42, 1891, p. 145.

³Roberts-Austen and Rücker: Phil. Mag., vol. 32, 1891, p. 355.

⁴Supposing basalt to melt below 1200° . The authors state that the specific heat of basalt is greater in the liquid than in the solid state, but no remarks are made as to whether the rock was fused at their higher temperatures or not.

APPARATUS.

43. *The rock to be tested.*—About 30 grams of diabase were fused in a small platinum crucible, together with which they were to be dropped into the calorimeter. Two of these charged crucibles were in hand and used alternately. After removing the (cold) crucible from the water into which it had been dropped at red or white heat, the surface of the glass usually shows a smooth unfissured gloss. This, however, is only apparent, for after drying and weighing, the mass is often found to have increased in weight fully 5 per cent. I was at first inclined to believe that this was due to water chemically absorbed by the viscous magma; but the water is only mechanically retained, for it passes off completely after twenty-four hours' exposure to the atmosphere, or by drying at 200° for, say, 30 minutes. Hence, at the beginning of each measurement I weighed the crucibles again, having thoroughly dried them at 200° . The solid glass dropped into water at low red heat soon shows a rough and fissured surface, and changes in color from black to brown, possibly from the oxidation of the protosilicate to the sesquisilicate of iron. The effect of this change (if it be a chemical change and not a mere change of the optical character of the surface) is inappreciable, at least by the following calorimetric method.

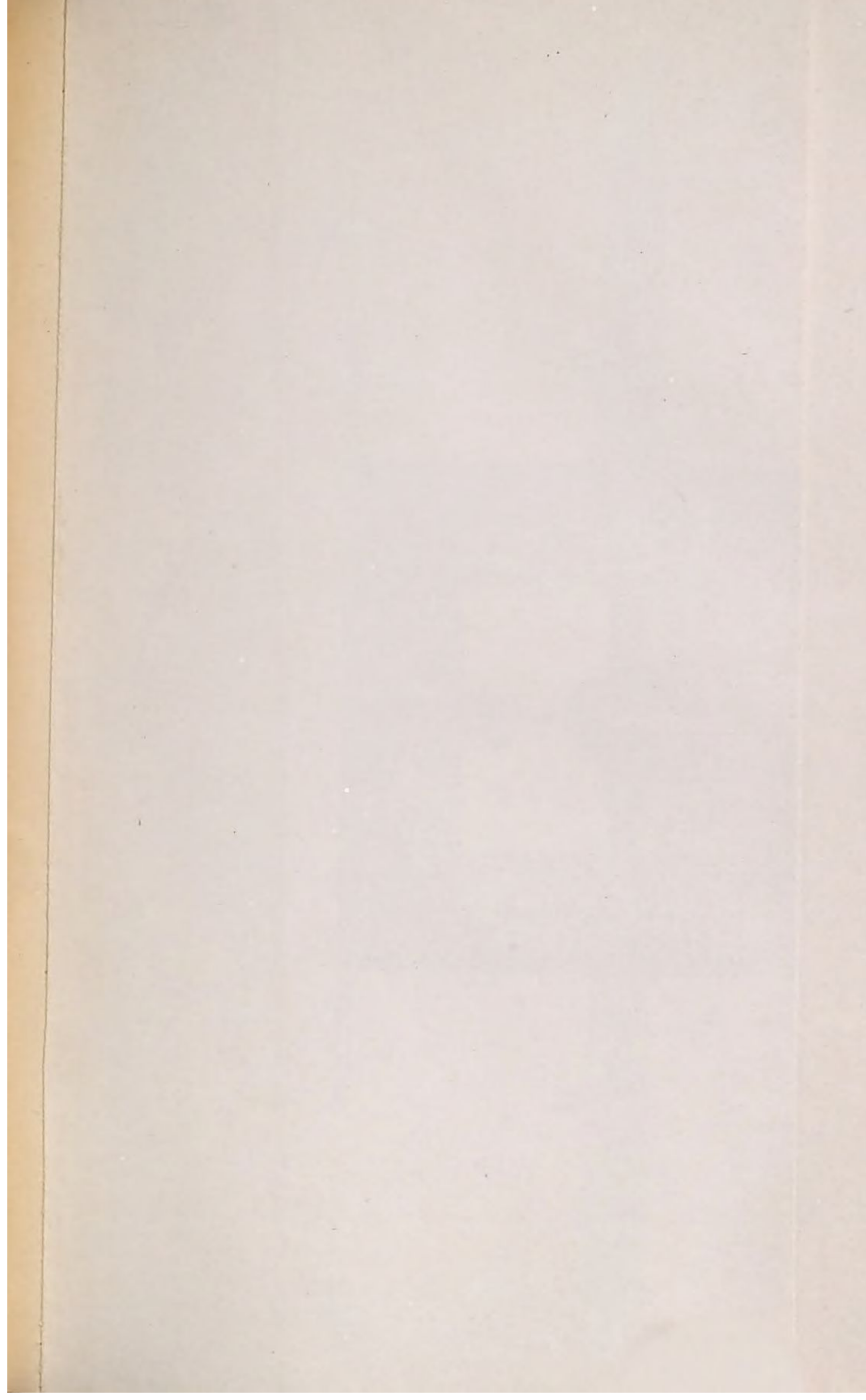
Throughout the course of the work the charge was neither changed nor replenished.

44. *Thermal capacity of platinum.*—Since the charge of molten rock and the crucible are submerged together, it is necessary to know the heat given out by the known weight of the platinum. Data for this purpose have been published by Violle.¹ In these the high temperature specific heat at t° is given as $\cdot 0317 + \cdot 000012t$, whence the increase of thermal capacity from zero to the same temperature is $(\cdot 0317 + \cdot 000006t) t$. This is the allowance I made per gram of platinum crucible.

45. *Furnace.*—Inasmuch as heat is rapidly lost by radiation from the white hot slag, it is necessary to transfer the crucible from the furnace into the water swiftly. Trap-door and false-bottom arrangements, which at first suggested themselves, were discarded, because the mechanism clogs the furnace, interferes with constancy of temperature, and is too liable to get out of order.

The furnace adopted is shown in Pl. VII, Figs. 1 and 2, in sectional elevation and plan. The body consists of two similar but independent half cylinders *AA* and *BB* of fire clay, properly jacketed and closed below, which come apart along the vertical plane *cccc*. The lid *LL*, however, is a single piece, fixed in position by an adjustable arm (not shown). Each of the halves of the body of the furnace is protected by a thick coating of asbestos *CC*, *DD*, and by a rigid case of thick sheet iron, *EE*, *FF*; clamp screws *g, g, g, g*, pass through this in such a way as

¹Violle: C. R., vol. 85, 1877, p. 543; vol. 87, 1878, p. 981; vol. 89, p. 702, 1879; Phil. Mag., (5), IV, p. 318, 1877.



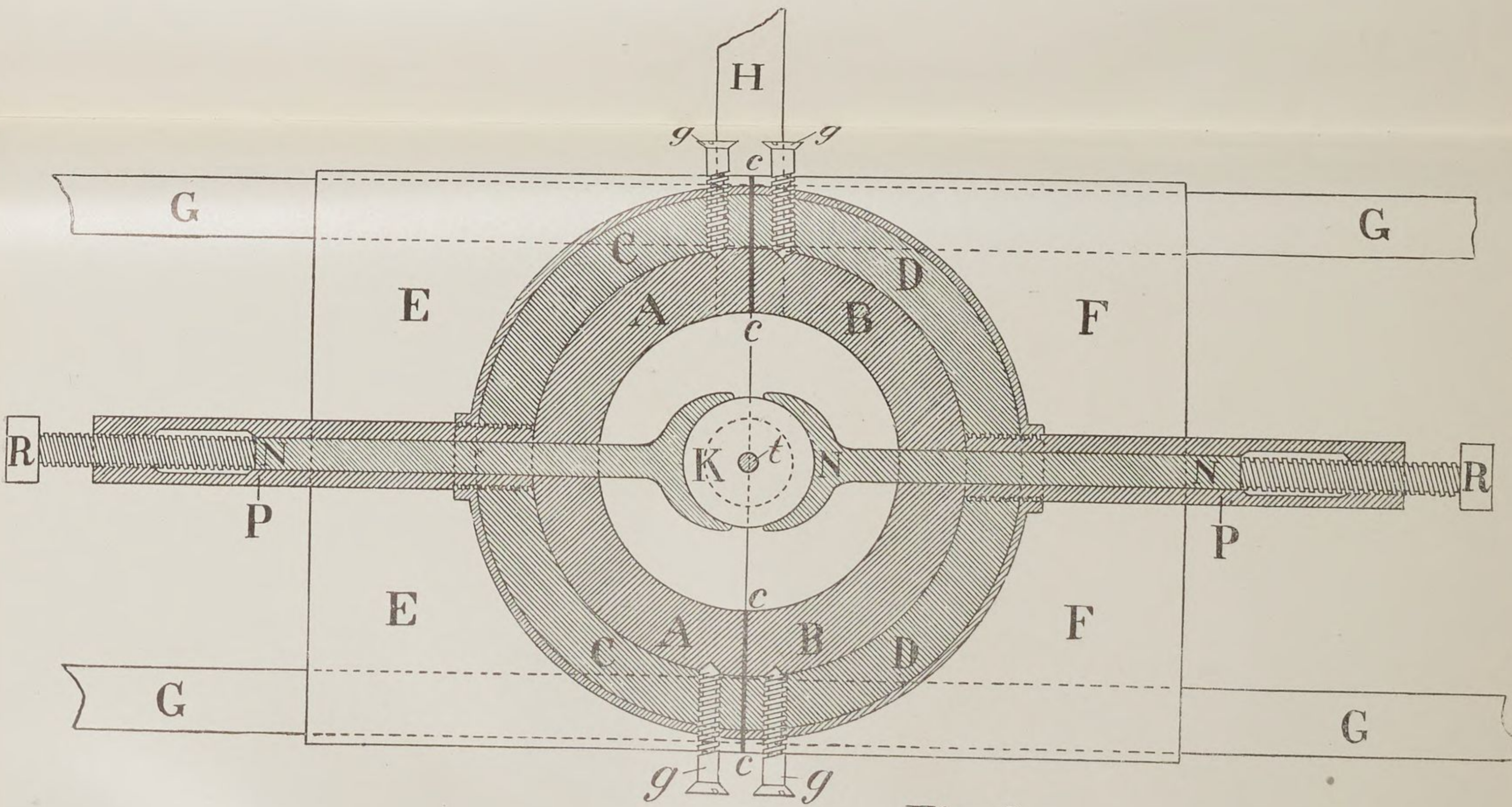
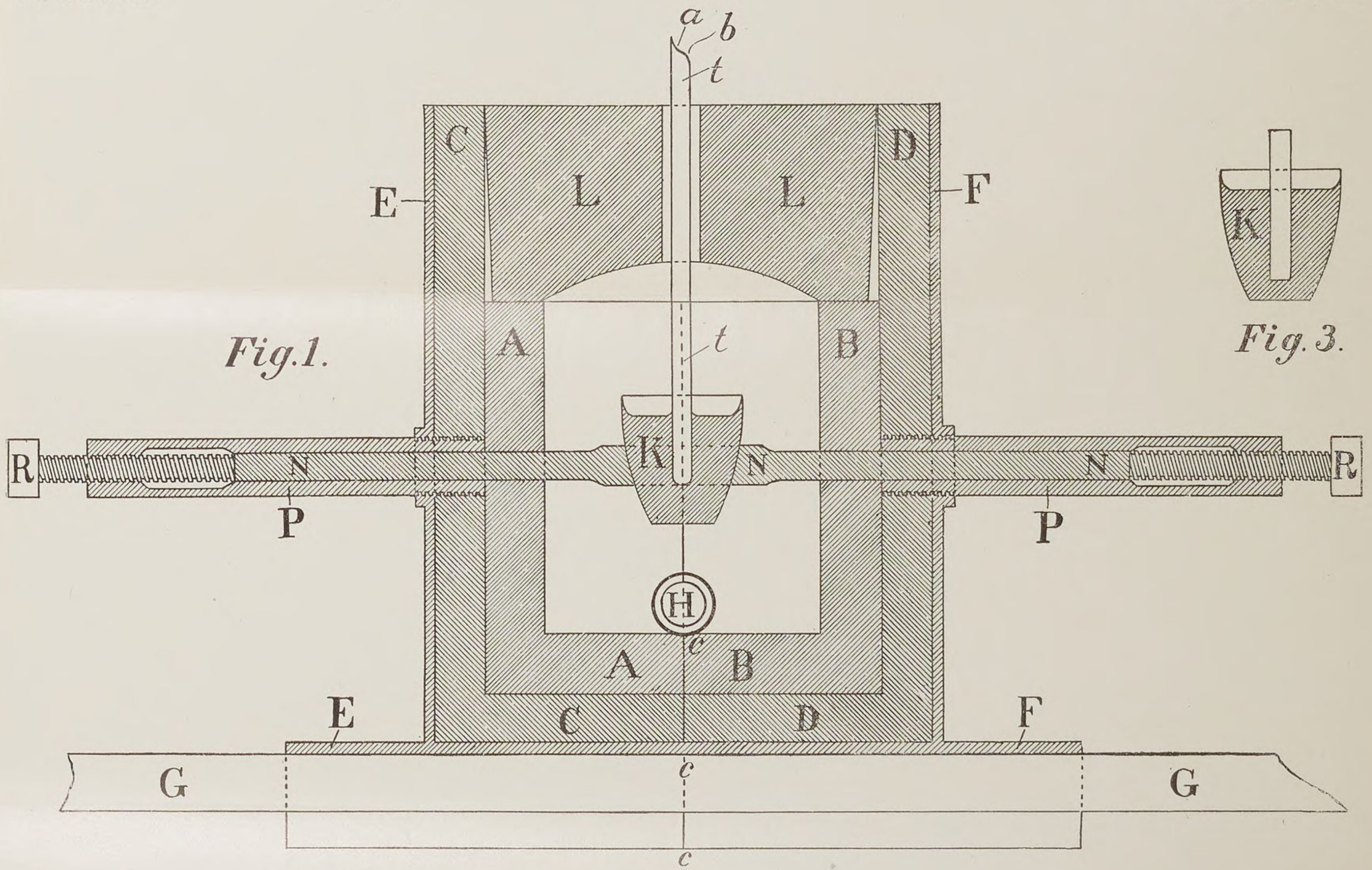


Fig. 2.

FURNACE FOR CALORIMETRY, WITH THE BODY K (CRUCIBLE), THE PYROMETER *tt*, AND THE HOLDERS *NN* IN PLACE. SCALE $\frac{1}{2}$.

to hold the fire clay and asbestos firmly in place. The horizontal base of the casing *E, F*, is bent partially around the two iron slides *G, G*, along which the two halves of the furnace may therefore be moved at pleasure while the lid *L* is stationary, as is also the blast burner *H*, clamped on the outside and entering the furnace through a hole left for that purpose.

The charged crucible is shown at *K*, and is held in position by two crutch-shaped radial arms, *N, N*, of fire clay, the cylindrical shafts of which fit the iron tubes *P, P* snugly and are actuated by two set screws, *R, R*. The two tubes *P, P*, moreover, are covered with a non-conductor, and thus subserve the purposes of handles, by grasping which the two halves of the furnace may be rapidly jerked apart. It is by this means that the crucible is suddenly dropped out of the furnace into the calorimeter below. Care must be taken to have the arms free from slag, as otherwise the crucible is not at once released.

46. *Temperature*.—As in a former case, the temperature of the furnace is regulated at pleasure by forcing the same quantity of air through it at all times, but lading this air with more or less gas supplied by a graduated stop cock. The amount of gas necessary in any case is determined by trial, and observations are only to be taken after fifteen or twenty minutes' waiting, when the distribution of temperature is found to be nearly stationary. It would have been better to have curved the bottom of the furnace cylindrically, so as to surround the crucible with a whorl of flame. The temperature of the crucible is never quite constant from point to point. I therefore measured this datum at three points, near the bottom, middle, and top of the charge. For this purpose the fire clay insulator *t t* of the platinum-platinum-iridium thermocouple *ab* passing through a hole in the lid is adjustable along the vertical. Before dropping the crucible the thermocouple is withdrawn from the charge and suspended above it. The cold junction communicates with the terminals of the zero method submerged in a bath of petroleum and provided with a thermometer.

When the charge is solid, a small platinum tube which has been previously sunk into the molten glass before solidification (see Pl. VII, Fig. 3), enables the observer to make the three temperature measurements, as before. In later measurements I also incased the insulator of the thermocouple in a platinum tube, closed below (see Pl. VII, Fig. 1), when making the temperature measurements for the molten charge. Slag at high temperature being a good conductor, it is not impossible that hydro-electromotive forces may enter, slightly distorting the thermoelectric data.

When constancy of temperature is being approached the hole in the lid *L L* is closed with asbestos, and the products of combustion escape by the seam in the side. This facilitates manipulation above the furnace. The crucible is visible in part through the seam in question.

47. *Calorimeter.*—This was a vessel of thin tinned sheet iron, 28 centimeters long and 8 centimeters in diameter, having a water value of 19 g. cal. and holding a charge of about 1,200 grams of water. The inside of the calorimeter was provided with a helical strip running nearly from top to bottom. The vessel, contained within a suitable environment, was supported on a hard rubber stem, which could be grasped below, and served as an axle around which the calorimeter could be rotated from without. In this way the water within was churned. Three small, hard-rubber rowels near the top gave steadiness to the motion. They were fixed to the hollow cylindrical vessel (environment) provided with a hollow hinged lid, through both of which a current of cold water, at constant temperature, continually circulated. Thus the temperature surrounding the calorimeter was at all times given, and the correction for cooling could be found and applied with accuracy. I pass by the description of this apparatus rapidly here, inasmuch as I shall recur to it in connection with other calorimetric work. The box of the calorimeter with its projecting stem was movable on a small tramway, the tracks of which lay at right angles to the slides *G G*. (Pl. VII, Figs. 1 and 2.) Thus when the measurements showed a sufficiently constant temperature in the furnace, the lid of the box was opened and the calorimeter rolled directly under the furnace. After receiving the crucible, the calorimeter was again rolled away and the lid of the box closed, whereupon the temperature measurements were made by aid of a sensitive thermometer inserted through a hole in the lid.

I may add here that should I have occasion to extend the work to other substances, I would have a bullet-shaped platinum crucible provided with a central tube similar to Fig. 3, made at the outset. In this way splashing during the drop of the crucible into water would be to a great extent obviated.

RESULTS.

48. *Method of work.*—While waiting for the temperature of the furnace to become stationary, I made the initial measurements for the cooling of the calorimeter, in time series. Knowing, therefore, the time at which the body was dropped, I also knew accurately the temperature of the water into which it was dropped. Just before this the three measurements for temperature of the charge had also been made in time series. The experiments showed that ten minutes after submergence, the crucible and charge might be safely considered cold, for the minimum temperature of the calorimeter was reached after about five minutes. Hence the time from 10 minutes to 15 minutes after submerging could be utilized for making the final measurements for cooling. Knowing these, I interpolated the rates of cooling for any intermediate times.

Thus while the calorimeter was being constantly stirred, its temperature was measured at the end of every minute. Hence I knew the

mean excess of its temperature above that of its environment during the course of every minute, and was able to add the corresponding allowance for radiation at once. How important this is the tables below will fully show. It may amount to 10 per cent of the total temperature increment. The only drawback against obtaining sharp values for the consecutive rates of cooling is to be found in the lag error of the thermometer; but this is eliminated in a long series.

The calorimeter was always weighed before and after the work, but the latter datum was taken. Similarly, as has been stated, the crucible was weighed before and after heating and the latter datum taken. Some charge is always removed or added by the thermocouple.

49. *Arrangement of the tables.*—There being two crucibles and two tubes (Pl. VII, Fig. 3), they are distinguished by *I* and *II*. In all cases τ is the temperature of the environment, m the mass of the charge, M the water value of the calorimeter (corrected for temperature). Θ is the temperature at the bottom, middle, and top of the charge at the time of submergence, for which a mean value is also given. The temperature observed in the calorimeter at the time specified is given under θ , and a parallel column shows the correction of θ for radiation. Finally, the computed thermal capacity of the platinum crucible and appurtenances (correction h), and the thermal capacity h of the charge given for each of the consecutive times, are found in the last columns. A few obvious remarks follow. All data are referred to gram calories.

50. *Tables.*—In the data of the first series (Table 16) only one value of Θ occurs for the liquid state. Moreover, the construction of the furnace was somewhat faulty, not being flat-bottomed. Hence these results are of inferior accuracy, and their chief purpose is to bear out the results of Table 17, which are the best I could obtain.

TABLE 16.—*Thermal capacity of diabase. First series.*

Platinum crucible *I*, 11.169 g; platinum tube *I*, .985 g.
Platinum crucible *II*, 11.271 g; platinum tube *II*, .654 g.

No.	τ	Time.	Θ	Mean Θ $\frac{M}{m}$	θ	Correc- tion θ	correc- tion h .	h .	Remarks.
	°C	minutes.			°C		g. cal.	g. cal.	
I	16	25		1306°	25.90				Immersion Liquid. } 364
		26	.....	1145 g	34.90	.07	16.6	291	
		27	.....	33.75 g	36.30	.17	.....	342	
		28	.....	.....	36.60	.27	.....	355	
		30	.....	.....	36.59	.48	.....	363	
		33	.....	.....	36.32	.79	.....	364	
		36	.....	.....	36.04	1.10	.....	365	
I	12	5		1367°	14.92				Immersion Liquid. } 370
		6	.....	1202 g	22.80	.02	17.9	267	
		7	.....	33.36 g	25.20	.06	.....	355	
		8	.....	.....	25.50	.11	.....	367	
		10	.....	.....	25.58	.20	.....	372	
		13	.....	.....	25.40	.33	.....	370	
		16	.....	.....	25.25	.46	.....	370	
II	12	19			25.12	.60		370	Immersion Liquid. } 385
		26	.....	1378°	22.16	.....	.....	.....	
		27	.....	1202 g	30.00	.05	20.7	302	
		28	.....	29.32 g	31.00	.13	.....	346	
		29	.....	.....	31.70	.21	.....	378	
		31	.....	.....	31.67	.38	.....	384	
		34	.....	.....	31.42	.63	.....	384	
		37			31.21	.87		385	
		40	.....	.....	30.97	1.11	.....	386	

TABLE 16.—*Thermal capacity of diabase. First series—Continued.*

No.	τ	Time.	Θ	Mean Θ M $m.$	θ	Correc- tion θ	correc- tion $h.$	$h.$	
	$^{\circ}\text{C}$	minutes.			$^{\circ}\text{C}$		g. cal.	g. cal.	
I	12	36		1337°	14.55				Immersion Liquid.
		37	.....	1196g	22.40	.02	18.0	275	
		38	.....	32.22g	24.00	.07	.....	337	
		39	.....	.....	24.80	.12	.....	368	
		41	.....	.....	24.79	.23	.....	371	
		44	.....	.....	24.68	.39	.....	373	
		47	.....	.....	24.55	.54	.....	375	
II	12	50			24.40	.69		375	} 373 Immersion Liquid.
		9	.....	1274°	21.92	.....	.....	.....	
		10	.....	1196g	28.50	.05	17.1	256	
		11	.....	29.16g	29.80	.13	.....	312	
		12	.....	.....	30.60	.21	.....	349	
		14	.....	.....	30.63	.38	.....	356	
		17	.....	.....	30.42	.62	.....	358	
I	12	20			30.22	.86		359	} 358 Immersion Solid.
		23	.....	.....	29.98	1.10	.....	359	
		15	1199	1166°	14.87	.....	.....	.....	
		16	1163	1195g	22.60	.03	16.7	271	
		17	1138	32.22g	23.10	.09	.....	292	
		18	.....	.....	23.30	.15	.....	302	
		20	.....	.....	23.37	.27	.....	308	
II	12	23			23.21	.45		309	} 311 Immersion Solid.
		26	.....	.....	23.15	.63	.....	314	
		29	.....	.....	22.98	.81	.....	314	
		1	1100	1078°	21.16	.....	.....	.....	
		2	1074	1196g	27.20	.04	16.4	232	
		3	1060	29.16g	27.80	.09	.....	259	
		4	.....	.....	27.90	.15	.....	266	
I	11	6			27.76	.25		264	} 263 Immersion Solid.
		9	.....	.....	27.59	.42	.....	264	
		12	.....	.....	27.41	.58	.....	263	
		15	.....	.....	27.25	.74	.....	263	
		1	1021	1001°	14.89	.....	.....	.....	
		2	998	1196g	20.40	.02	13.9	191	
		3	983	32.23g	21.40	.07	.....	230	
II	11	4			21.58	.11		238	} 242 Immersion Solid.
		6	.....	.....	21.58	.20	.....	242	
		9	.....	.....	21.45	.34	.....	242	
		12	.....	.....	21.31	.47	.....	242	
		2	1035	1025°	19.76	.....	.....	.....	
		3	1025	1195g	25.00	.03	15.5	201	
		4	1015	29.16g	25.90	.08	.....	240	
I	11	5			26.20	.14		254	} 253 Immersion Solid.
		7	.....	.....	26.10	.25	.....	255	
		10	.....	.....	25.90	.41	.....	253	
		13	.....	.....	25.72	.57	.....	252	
		16	.....	.....	25.55	.73	.....	252	
		1	889	880°	16.19	.....	.....	.....	
		2	880	1198g	21.80	.03	12.0	198	
II	11	3	872	32.24g	21.90	.06		203	} 204 Immersion Solid.
		4	.....	.....	21.94	.10	.....	206	
		6	.....	.....	21.83	.18	.....	204	
		9	.....	.....	21.70	.30	.....	204	
		12	.....	.....	21.59	.41	.....	204	
		8	827	829°	20.07	.....	.....	.....	
		9	827	1192g	24.50	.04	12.1	171	
II	11	10	833	29.16g	24.90	.09		189	} 191 Immersion Solid.
		11	.....	.....	24.90	.14	.....	191	
		13	.....	.....	24.85	.23	.....	193	
		16	.....	.....	24.67	.37	.....	191	
		19	.....	.....	24.51	.51	.....	190	
		22	.....	.....	24.39	.65	.....	190	

TABLE 17.—*Thermal capacity of diabase. Second series.*

Platinum crucible *I*, 11.169g; Platinum tube *I*, .985g.
 Platinum crucible *II*, 11.271g; Platinum tube *II*, .654g.

No.	τ	Θ	Mean Θ M $m.$	Time.	θ	Correc- tion θ	Correc- tion $h.$	$h.$	
	°C.	°C.		minutes.	°C.	°C.	g. cal.	g. cal.	
II	12	1265	1251°	4	18.94				Immersion Liquid.
		1246	1189g	5	24.60	.04	20.6	236	
		1241	26.39g	6	26.05	.10		305	
				7	26.52	.16		329	
				9	26.61	.30		339	
				12	26.45	.50		341	
				15	26.25	.69		340	
				18	26.08	.88		341	
I	12	997	993°	2	14.07				Immersion Solid.
		995	1192g	3	20.20	.01	13.8	213	
		987	32.22g	4	20.56	.03		227	
				5	20.80	.05		237	
				7	20.80	.10		239	
				10	20.75	.16		239	
				13	20.61	.22		237	
II	12	1260	1251°	3	19.34				Immersion Liquid.
		1251	1190g	4	26.00	.04	20.8	285	
		1243	26.07g	5	27.00	.10		333	
				6	27.20	.16		345	
				8	27.03	.27		342	
				11	26.86	.45		343	
				14	26.69	.62		343	
				17	26.49	.80		342	
II	10	1354	1334°	5	13.78				Immersion Liquid.
		1333	1190g	6	20.60	.03	22.4	288	
		1319	26.27g	7	21.80	.09		345	
				8	22.20	.15		366	
				10	22.23	.28		373	
				13	22.15	.47		377	
				16	21.97	.65		378	
				19	21.79	.84		378	
I	10	954	948°	9	20.24				Immersion Solid.
		948	1186g	10	26.00	.05	13.0	201	
		942	32.22g	11	26.40	.12		218	
				12	26.52	.19		225	
				14	26.42	.33		227	
				17	26.22	.53		227	
				20	26.01	.74		227	
				23	25.81	.94		227	
II	10	1364	1352°	9	17.18				Immersion Liquid.
		1354	1194g	10	23.70	.04	23.1	277	
		1329	26.05g	11	24.80	.10		330	
				12	25.20	.16		351	
				14	25.42	.29		368	
				17	25.19	.49		366	
				20	25.01	.68		367	
				23	24.82	.87		367	
I	10	877	873°	0	14.83				Immersion Solid.
		873	1191g	1	19.80	.02	11.9	173	
		870	32.20g	2	20.30	.06		193	
				3	20.60	.09		205	
				5	20.48	.16		203	
				8	20.38	.26		203	
				11	20.23	.36		201	
				14	20.13	.46		201	
II	10	1176	1166°	5	17.40				Immersion Liquid.
		1164	1187g	6	24.30	.04	19.2	281	
		1158	25.97g	7	24.70	.10		301	
				8	24.80	.16		308	
				10	24.75	.27		311	
				13	24.55	.44		309	
				16	24.39	.60		309	
				19	24.21	.77		309	
II	10	1215	1197°	7	14.38				Immersion Liquid.
		1191	1192g	8	20.00	.03	19.9	239	
		1186	25.95g	9	20.80	.07		278	
				10	21.50	.12		312	
				12	21.55	.21		319	
				15	21.40	.35		318	
				18	21.26	.49		318	
				21	21.13	.62		318	
I	10	782	781°	9	19.36				Immersion Solid.
		780	1189g	10	24.00	.05	10.4	163	
		780	32.19g	11	24.20	.12		173	
				12	24.18	.19		175	
				14	24.13	.33		178	
				17	23.95	.54		179	
				20	23.81	.74		181	
				23	23.61	.94		181	

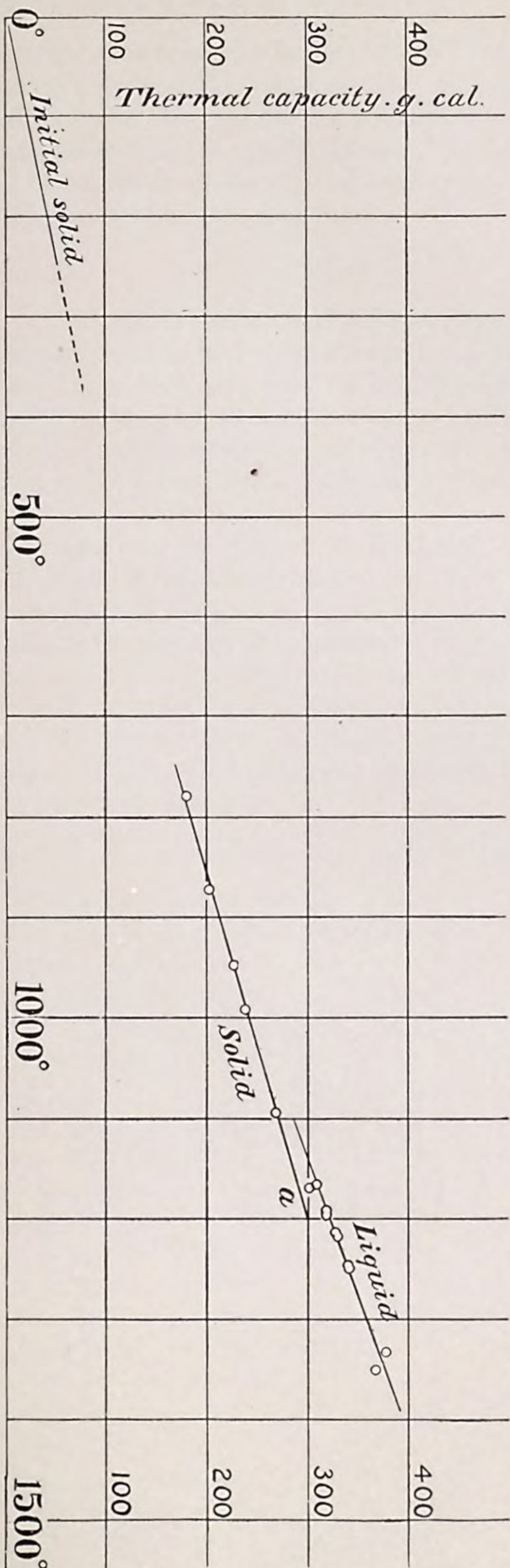
TABLE 17.—*Thermal capacity of diabase. Second series—Continued.*

No.	τ	Θ	Mean Θ M $m.$	Time.	θ	Correc- tion θ	Correc- tion $h.$	$h.$	
	$^{\circ}\text{C.}$	$^{\circ}\text{C.}$		minutes.	$^{\circ}\text{C.}$	$^{\circ}\text{C.}$	g. cal.	g. cal.	
II	10 $^{\circ}$	1204	1194 $^{\circ}$	8.5	14.54	—	—	—	Immersion
		1195	1195 $^{\circ}$	10	21.60	.03	19.9	307	Liquid.
		1183	25.90 $^{\circ}$	11	21.70	.08	—	314	
				12	21.70	.13	—	316	
				14	21.63	.23	—	318	
				17	21.49	.37	—	318	
				20	21.36	.51	—	318	
				23	21.22	.66	—	318	
									} 317.9
I	10	1177	1171 $^{\circ}$	8	19.88	—	—	—	Immersion
		1170	1192 $^{\circ}$	9	25.20	.05	16.7	182	Solid.
		1166	32.20 $^{\circ}$	10	28.20	.13	—	296	
				11	28.30	.21	—	303	
				13	28.07	.37	—	300	
				16	27.95	.62	—	304	
				19	27.62	.86	—	302	
				22	27.37	1.10	—	301	
									} 301.6
I	11	1106	1096 $^{\circ}$	0	16.28	—	—	—	Immersion
		1094	1195 $^{\circ}$	1	22.70	.03	15.5	224	Solid.
		1088	32.21 $^{\circ}$	2	23.60	.08	—	259	
				3	23.75	.13	—	266	
				5	23.69	.23	—	268	
				8	23.54	.39	—	268	
				11	23.39	.54	—	268	
				14	23.24	.68	—	268	
									} 268.2
II	11	1262	1248 $^{\circ}$	1	19.72	—	—	—	Immersion
		1244	1191 $^{\circ}$	2	25.90	.05	21.1	270	Liquid.
		1238	25.49 $^{\circ}$	3	26.60	.11	—	305	
				4	27.20	.17	—	336	
				6	27.11	.31	—	338	
				9	26.92	.50	—	339	
				12	26.73	.70	—	339	
				15	26.55	.89	—	339	
									} 338.8
I	11	1237	1218 $^{\circ}$	8	13.67	—	—	—	Immersion
		1216	1188 $^{\circ}$	9	20.60	.02	17.7	263	Liquid.
		1202	29.43 $^{\circ}$	10	21.40	.07	—	297	
				11	22.00	.12	—	324	
				13	22.05	.23	—	330	
				16	21.90	.38	—	330	
				19	21.75	.54	—	330	
				22	21.60	.69	—	330	
									} 330.3
II	11	1224	1215 $^{\circ}$	5	19.73	—	—	—	Immersion
		1215	1185 $^{\circ}$	6	25.20	.04	20.4	235	Liquid.
		1205	25.57 $^{\circ}$	7	26.40	.11	—	293	
				8	26.90	.19	—	320	
				10	26.90	.32	—	326	
				13	26.68	.54	—	326	
				16	26.49	.75	—	327	
				19	26.27	.95	—	326	
									} 326.6

For brevity the last observations have been averaged per three minutes, and under h the mean for the last 11 minutes is usually given.

Thus in Series I the difference of temperature from top to bottom of the crucible is as large as 61° at 1200° , but falls off pretty regularly to 6° at 829° . In Series II the corresponding mean difference is about 25° at 1300° , 20° at 1200° , 14° at 1100° and 1000° , and 10° at 900° and 800° . The error thus involved can not be greater than 2 per cent in the extreme case; but since the distribution of temperatures is actually measured, the error is probably negligible except at very high temperatures. I was inclined to infer that the greater constancy of the solid distribution as compared with the liquid was due to better conductivity in the former case (solid); but it may result as an equalizing effect of the tube, Pl. VII, Fig. 3.

Considering the observational work as whole, the data are quite satisfactory, seeing that an error of $\frac{1}{10}^{\circ}\text{C.}$ in the initial temperature of the



RELATION OF THERMAL CAPACITY (SOLID AND LIQUID) TO TEMPERATURE (°C.). SERIES I.

calorimeter must vitiate the result as far as at least 1 per cent. Hence the great care taken in finding this temperature. It is probable, however, that the real source of error is accidental and is encountered when the body falls out of the furnace into the water, particularly during the latter phase. Splashing, generation of steam, etc., then involve actual losses which can not be accounted for.

INFERENCES.

51. *Digest and charts.*—In Tables 18 and 19 I have summarized the chief data on a scale of temperature. The results are graphically given in the charts, Pls. VIII and IX, in which thermal capacity in gramme calories is constructed as a function of temperature. Straight lines are drawn through the points, showing the mean specific heats for the intervals of observation, solid and liquid. The letter *a* marks the region of fusion.

It will be seen that both in the cases of Pl. VIII and Pl. IX the solid points lie on lines which, if reasonably curved, would be nicely tangent to an initial specific heat of about .2 at 0° C. The grouping, in other words, is so thoroughly regular as quite to exclude the probability of any anomalous feature in the observed or the unobserved parts of the locus. In both charts the solid point near *a* alone lies markedly above the corresponding curve; but inasmuch as in my former work I found solidification to set in at 1,100° it is altogether probable that the occurrence at 1,170° is incipient fusion.

TABLE 18.—*Thermal capacity of diabase. Series I. Digest.*

Mean specific heat, liquid, 1200° to 1400°, .350.
Mean specific heat, solid, 800° to 1100°, .304.
Latent heat of fusion, at 1200°, 24^{gcal}; at 1100°, 16^{gcal}.

Solid.		Liquid.	
Tempera- ture.	Thermal capacity.	Tempera- ture.	Thermal capacity.
829	191	1274	358
880	204	1306	364
1001	242	1337	373
1025	253	1367	370
1078	263	1378	385
*1066	311		

*Incipient fusion? Tube sustained in the crucible.

TABLE 19.—*Thermal capacity of diabase. Series II. Digest.*

Mean specific heat, solid, 800° to 1100°, .290
 Mean specific heat, liquid, 1100° to 1400°, .360.
 Latent heat of fusion, 1200°, 24^{gcal}; at 1100°, 16^{gcal}.

Solid.		Liquid.	
Tempera- ture.	Thermal capacity.	Tempera- ture.	Thermal capacity.
°C.	gcal.	°C.	gcal.
781	180	1166	309
873	202	1194	318
948	227	1197	318
993	238	1215	327
1096	268	1218	330
*1171	302	1248	339
		1251	340
		1251	342
		1334	377
		1352	367

* Probably incipient fusion at the base of crucible (1177°).

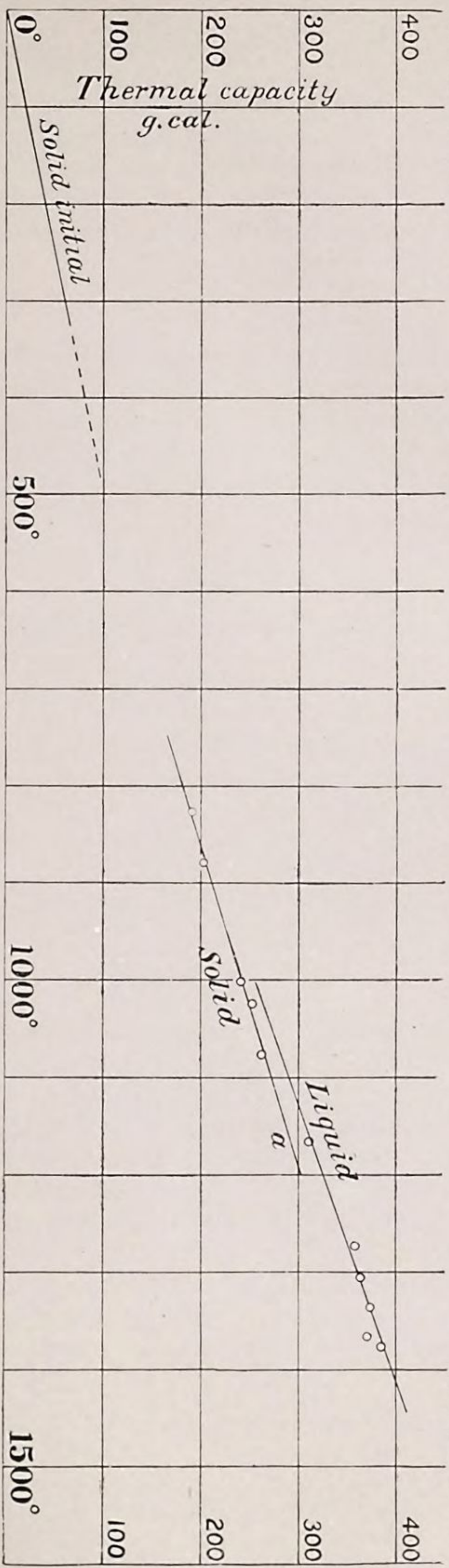
Quite the same regularity is observable in the liquid loci, remembering that in Pl. VIII only a single datum was taken for temperature, and that in Pl. IX the high-temperature discrepancies above 1300° are within the range given in § 50, and due to distribution of temperature.

52. *Specific heat.*—As regards the mean specific heat between 800° and 1000°, in Tables 18 and 19, it will be seen that the intermediate datum $(.304 + .290)/2$ would satisfy both groups of points about equally well. A tracing of one group of points nearly covers the other, while it is to be remembered that the true locus must be slightly curved. The same remarks may be made for the liquid state. I have discarded elaborate modes of reduction, since the equation of the locus would be arbitrary, and since the values for specific heat are of no immediate bearing on the present inquiry.

53. *Hysteresis.*—Recurring to the suggestion of the preceding paragraph, it appears, since in my volume experiments I was able to cool down the rock to 1095° before solidification definitely set in, whereas, now, evidences for fusion do not occur before 1170° (at *a*, Pls. VIII and IX) that rock fusion must be accompanied by hysteresis¹ of the same nature as that which I observed with naphthaline, § 37. The magnitude of the lag is apparently 70°, and its pressure equivalent may be estimated as 500 atmospheres.

54. *Latent heat.*—In virtue of the fact that the upper end of the solid locus can be carried so near the beginning of the liquid locus, the datum for latent heat is determinable with some accuracy. A difficulty, however, presents itself in the determination of the true melting point, a datum which can only be sharply defined while the temperature of the crucible is quite constant throughout. I, therefore, state the conditions at 1200° and at 1100°, where the latent heats would be 24 and 16 gramme calories respectively, in both of the independent constructions of Pl. VIII and Pl. IX. This coincidence is in a measure accidental.

¹ Am. Journal, XLII, p. 140, 1891.



RELATION OF THERMAL CAPACITY (SOLID AND LIQUID) TO TEMPERATURE (°C.). SERIES II.

It may be noticed that a transitional temperature surprisingly near the region of fusion is apparently indicated.

55. *The relation of melting point to pressure.*—The first and second laws of thermodynamics lead to the equivalent of James Thomson's fusion equation, which in the notation of Clausius¹ is

$$\frac{dT}{dp} = \frac{T(\sigma - \tau)}{E r'},$$

where T is the absolute melting point, $\sigma - \tau$ the difference of specific volumes solid and liquid at T , r' the latent heat of fusion, and E Joule's equivalent. Combining the present series, *I*, with the former series, *III*, of volume measurements,² I obtain at 1200° , since $T = 1470^\circ$, $\sigma - \tau = .0394/2.72$ (where 2.72 is the density of the solid magma at zero) and $r' = 24$,

$$\left(\frac{dT}{dp}\right)_{1200} = .021;$$

and at 1100° , since $T = 1370^\circ$, $\sigma - \tau = .0385/2.72$, and $r' = 16$,

$$\left(\frac{dT}{dp}\right)_{1100} = .029.$$

Similarly combining the present series, *II*, with the former series of volume measurements,³ *IV*, at 1200° , since $\sigma - \tau = .0352/2.72$ and $r' = 24$,

$$\left(\frac{dT}{dp}\right)_{1200} = .019;$$

and at 1100° , since $\sigma - \tau = .0341/2.72$ and $r' = 16$

$$\left(\frac{dT}{dp}\right)_{1100} = .026.$$

Hence the probable silicate value of dT/dp may be taken as .025, and falls nicely within the margin (.020 to .036) of corresponding data for organic substances (wax, spermaceti, paraffin, naphthaline, thymol). I may therefore justifiably infer that the relation of melting point to pressure, in case of the normal type of fusion, is nearly constant, irrespective of the substance operated on, and in spite of enormous differences of thermal expansibility and (probably) of compressibility. And in the measure in which this is true in passing from carbon compound to the thoroughly different silicon compound, it is more probably true for the same substance changed only as to pressure and temperature. In other words the relation of melting point to pressure is presumably linear.⁴

¹ Clausius: *Wärmetheorie*, I, p. 172, 1876. This is frequently called Clapeyron's equation.

² Chapter II, § 34.

³ Chapter II, § 35.

⁴ See my work on the continuity of solid and liquid (*Am. Journ. Sci.*, Vol. xlii, p. 144, 1891), in which these relations are tested for naphthaline within an interval of 2,000 atmospheres.

INDEX

	Page.		Page.
Antoine, equation of.....	21	Fusion changes density of rocks.....	26
Apparatus for ebullition.....	12, 13	Fusion changes--polymerism.....	26
Apparatus for fusion.....	27, 28	Fusion tube.....	30
Apparatus for calorimetry.....	46	Fusion volumetry, measurement of.....	33
Basalt, specific heat of.....	45	computations in.....	34
Bertrand, equation of.....	21, 24	errors of.....	35
Boiling crucible.....	13	Galvanometer (<i>see</i> Torsion galvanometer).....	14
Boiling points, apparatus for.....	12, 13	Groschaus, hypothesis of.....	11, 23
mercury.....	16	Hysteresis in fusions.....	54
sulphur.....	18	Kahlbaum on vapor tension.....	17
cadmium.....	19	King, Clarence, suggestions of.....	9, 25
zinc.....	19, 27	Laws of vapor tension.....	21
bismuth.....	20	Latent heat of diabase.....	54
equations for.....	21	Le Chatelier, pyrometer of.....	12
graphically compared.....	23	Magma, polymerism of.....	25
Boiling point, criterion.....	21	Melting point and pressure.....	44
Boiling points of Carnelley and Williams.....	23	Melting point criterion.....	54
Boiling tube.....	12	Melting point and pressure for diabase ..	55
Bismuth, boiling points of.....	20	Meniscus in fusion tube.....	36
Cadmium, boiling points of.....	19	Mercury, boiling points of.....	16
Calorimeter.....	48	Micrometer, vertical.....	31, 37
Calorimetry, apparatus for.....	46	Niess on rock fusion.....	25
method of.....	48	Polymerism in magmas.....	25
Carnelley and Williams on ebullition.....	23	Platinum, thermal capacity of.....	47
Cells, standard.....	28	Pyrometer, tests for.....	12, 26
Constants for vapor tensions.....	22	Ramsay and Young on vapor tension.....	17
Clapeyron's equation.....	55	Resistance (electric) of magmas.....	33
Contraction (<i>see</i> Expansion).....		Roberts-Austin, on calorimetry.....	45
Criterion for boiling points.....	21	Rücker (<i>see</i> Roberts-Austin).....	
Criterion for melting point.....	54	Sight tubes.....	31
Critical temperature, lower.....	43	Specific heat of diabase.....	54
Cyclic fusion.....	42	Sulphur, boiling points of.....	18
Data for expansion of diabase.....	37-41	Telephone registration.....	32
Diabase, for fusions.....	25, 46	Thermocouple.....	16, 27, 30, 40
data for expansion of.....	37-41	Thermal capacity, chart for.....	53
specific heat of.....	54	Of basalt.....	46
latent heat of.....	54	Of platinum.....	46
fusion and pressures for.....	55	Of diabase.....	49, 50, 51, 52, 53, 54
Dilatational strain in glass.....	38	Thomson J. J., equations of.....	24, 21
Dupré, equation of.....	21	Thymol, volumetry of.....	43
Equations for vapor tension.....	21	Torsion, galvanometer.....	14
Expansion of fusion tube.....	41	Tubes for, sight.....	31
Expansion of diabase, data for.....	37, 38, 39, 40, 41	Tube for fusions.....	30
Flotation of magmas.....	41	Vapor tension, contents of.....	22
Furnace for calorimetry.....	45	(<i>See</i> Boiling point).....	21
Furnace for volumetry.....	29	Viscous yielding of platinum.....	36
Fusion, apparatus for.....	27	Zinc, boiling points of.....	19, 27
Fusion under pressure.....	44	Zirkel, on rock fusion.....	26
Fusion and freezing alternating.....	42		

1	.....	1	.....
2	.....	2	.....
3	.....	3	.....
4	.....	4	.....
5	.....	5	.....
6	.....	6	.....
7	.....	7	.....
8	.....	8	.....
9	.....	9	.....
10	.....	10	.....
11	.....	11	.....
12	.....	12	.....
13	.....	13	.....
14	.....	14	.....
15	.....	15	.....
16	.....	16	.....
17	.....	17	.....
18	.....	18	.....
19	.....	19	.....
20	.....	20	.....
21	.....	21	.....
22	.....	22	.....
23	.....	23	.....
24	.....	24	.....
25	.....	25	.....
26	.....	26	.....
27	.....	27	.....
28	.....	28	.....
29	.....	29	.....
30	.....	30	.....
31	.....	31	.....
32	.....	32	.....
33	.....	33	.....
34	.....	34	.....
35	.....	35	.....
36	.....	36	.....
37	.....	37	.....
38	.....	38	.....
39	.....	39	.....
40	.....	40	.....
41	.....	41	.....
42	.....	42	.....
43	.....	43	.....
44	.....	44	.....
45		45	
46		46	
47		47	
48		48	
49		49	
50		50	
51		51	
52		52	
53		53	
54		54	
55		55	
56		56	
57		57	
58		58	
59		59	
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62		62	
63		63	
64		64	
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66		66	
67		67	
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70		70	
71		71	
72		72	
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74		74	
75		75	
76		76	
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79		79	
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81		81	
82		82	
83		83	
84		84	
85		85	
86		86	
87		87	
88		88	
89		89	
90		90	
91		91	
92		92	
93		93	
94		94	
95		95	
96		96	
97		97	
98		98	
99		99	
100		100	

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1904

UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

THE

GLACIATION OF THE YELLOWSTONE VALLEY
NORTH OF THE PARK

BY

WALTER HARVEY WEED



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CONTENTS.

	Page.
Letter of transmittal.....	9
Outline of this paper	11
Introduction.....	13
General description of the region	14
The Yellowstone glacier	14
Limits of glaciation	15
Cinnabar Valley of the Yellowstone	15
Bear Gulch and Sheep mountain	15
Sepulcher mountain.....	16
The valley bottom	16
Cinnabar mountain	16
Cinnabar basin	17
Transportation of bowlders to higher levels	18
Yankee Jim canyon.....	18
Emigrant valley	19
Mountain canyons	20
Morainal heapings.....	20
Morainal lakes.....	21
Basalt tables	22
Glacial stream channels.....	23
Drift deposits	24
Terraces.....	25
Striated valley slopes	26
Foothill canyons	27
Relations of canyons to drift	30
Origin of transverse canyons.....	30
Glacial flood plain.....	31
Alluvial terraces.....	31
Discussion of evidence.....	33
The Boulder glaciers.....	34
General description	34
Névé fields	36
Canyons	37
Moraines	38
Terraces.....	39

ILLUSTRATIONS.

	Page.
Plate I. Map showing the distribution of glacial drift in the Yellowstone valleys north of the National Park.....	12
II. Duck lake, a moraine dammed sheet of water	20
III. Mouth of Emigrant gulch showing glaciated mountain gorge opening into Yellowstone valley.....	22
IV. Glaciated walls of Boulder canyon showing occupancy of entire canyon by ice.....	36
FIG. 1. Glacial terraces of marginal area, valley of the Yellowstone.....	26

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY,
YELLOWSTONE NATIONAL PARK DIVISION,
Washington, D. C., May 18, 1892.

SIR: I have the honor to transmit herewith a paper by Mr. Walter H. Weed, entitled "The Glaciation of the Yellowstone Valley north of the Park."

During glacial times the broad elevated region of the Yellowstone Park was deeply covered by ice, sending out its glaciers both to the north and south. The northern glacier, after emerging from the park, entered the broad valley below, near the junction of the Gardiner and Yellowstone rivers. In the present paper Mr. Weed presents the results of his investigations of the glacial phenomena of the valley. It is a valuable contribution to glacial geology, and, so far as I am aware, is the first detailed study of such phenomena in an inclosed mountain valley in the Rocky mountains.

I take pleasure in recommending Mr. Weed's paper for publication as a bulletin of the U. S. Geological Survey.

Yours, very respectfully,

ARNOLD HAGUE,
Geologist in charge.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

LETTER OF TRANSMITTAL.

Department of the Interior,
U. S. Geological Survey,
Washington, D. C., May 15, 1894.

I have the honor to transmit herewith a paper by Mr. Henry A. Hoot, entitled "The Glaciation of the Yellowstone Valley and of the Lake."
This paper deals with the local glacial history of the Yellowstone Valley, and is a valuable contribution to the knowledge of the glacial history of the region. It is a paper of great interest and value, and is one of the best papers on the subject of the glacial history of the Yellowstone Valley that has been published. It is a paper of great interest and value, and is one of the best papers on the subject of the glacial history of the Yellowstone Valley that has been published.
I have the honor to recommend this paper for publication in the Bulletin of the U. S. Geological Survey.
Yours very respectfully,

James H. Brown,
Geologist in Charge.

Hon. J. M. McKim,
Director U. S. Geological Survey.

OUTLINE OF THIS PAPER.

The present paper gives a detailed account of the glaciation of the Snowy mountains and of the upper valleys of the Yellowstone, whose deposits show an unusual phase of alpine glaciation.

The evidence thus far gathered shows that a large body of ice, originating in the ice sheets of the Yellowstone National Park, pushed northward, filling the upper valleys of the Yellowstone and extending down that stream 36 miles north of the park boundary.

The high mountainous area east of the Yellowstone river, a large part of which is above 9,000 feet in elevation, was largely mantled by great snow fields and névés, above which the sharper summits projected as spires of rock, giving rise to great glaciers moving outwards down the valleys in all directions, forming the Boulder glacier and many small streams flowing toward the valley of the Stillwater, while other glaciers filled the valleys south and east and became tributary to the Yellowstone glacier. The high country about Haystack peak and Mount Douglas was the center of dispersion for this great ice field.

This evidence shows conclusively that there was no general system of confluent glaciers covering all the mountain ranges, but that even the greatest of these glaciers extended down the valleys a comparatively short distance and did not reach the general foothill country, while such considerable mountain masses as the Gallatin range and the high and rugged peaks east of the Lower canyon of the Yellowstone, held only local glaciers which nestled in the cirques about the crest of the range or rarely extended a short distance down the valleys. The area covered by glacial deposits is indicated upon the accompanying map.

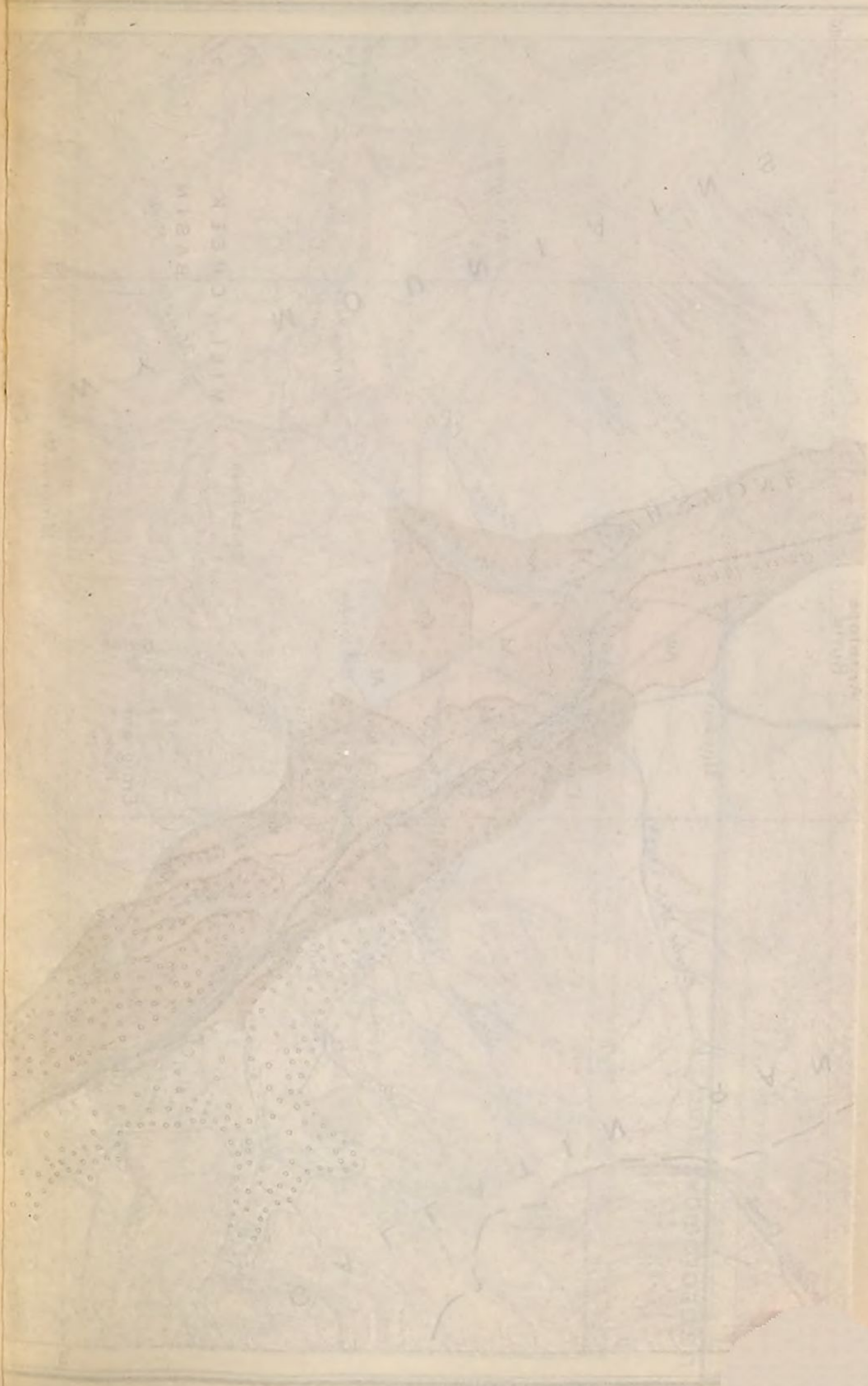
These glaciers were all of the alpine type and present many resemblances to those now existing in the Mount St. Elias alps. The largest valleys—the Yellowstone and Boulder—were occupied by trunk glaciers, completely filling them and overriding their flanks, and receiving tribute from the lateral valleys where the ice bodies occupying them were large enough to reach the main valley. Throughout the entire field the higher mountain peaks rose above the névé fields, though the high plateaux and broader mountain summits show considerable glacial abrasion and were unquestionably covered by moving ice.

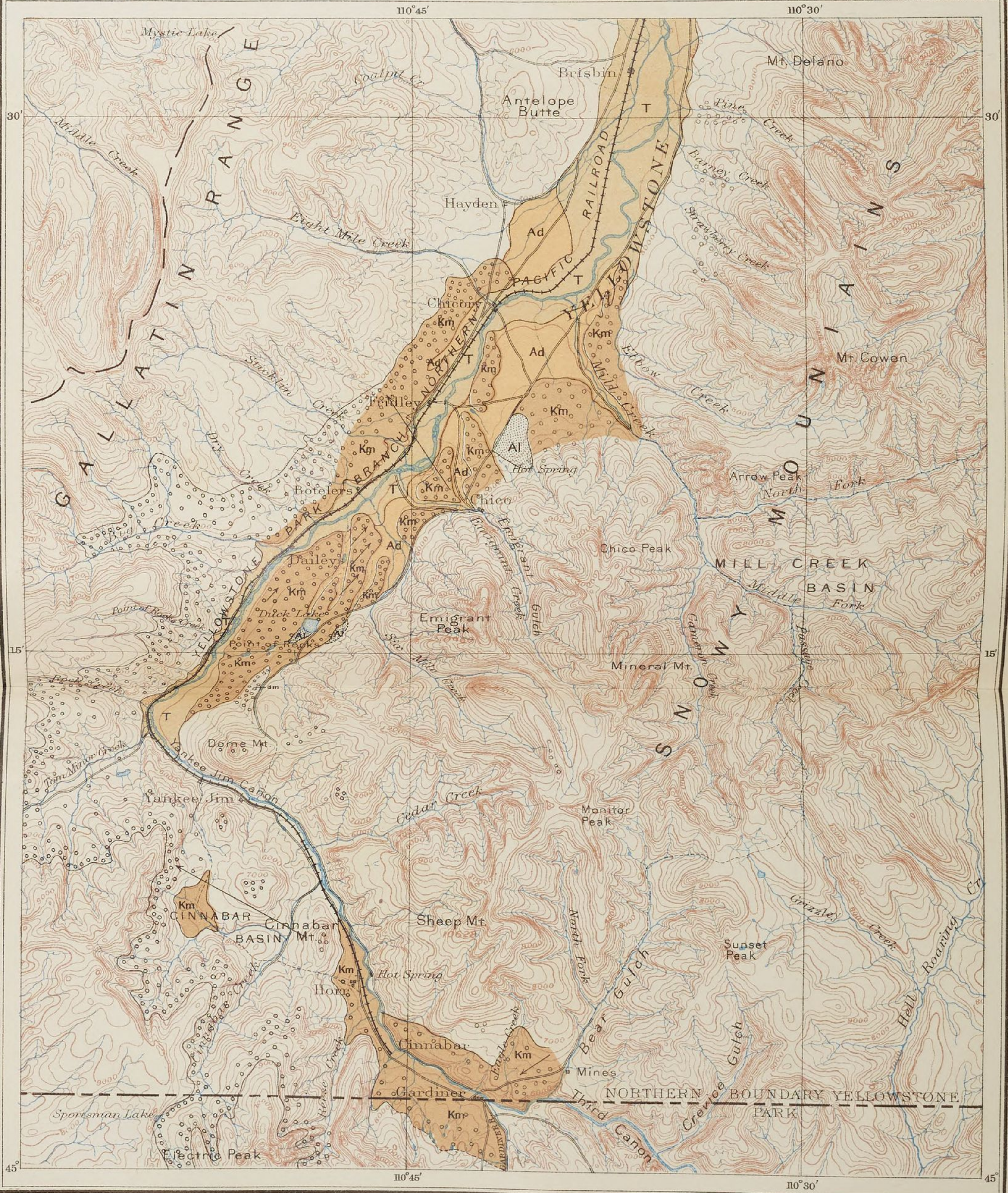
The evidence establishing the former existence of these glaciers consists of the varied forms of glacial sculpturing: Roche moutonnées, canyon-broadening, rock-scoring and polishing, and the formation of rock basins; and the various types of glacial deposits, boulder trains, blocs perche, the transportation of boulders from lower to higher elevations, moraines and kames, and the associated trains of gravel forming the system of river terraces, the formation of benches and terraces upon hillsides, and the cutting of canyons transverse to the mountain slopes and drainages in front of the glacier's termination. The striking contrast between glacial and non-glacial topography is splendidly exhibited in this field.

OUTLINE OF THE TARIFF

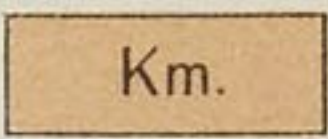
The present paper is a detailed account of the tariff system in the United States, and is intended to be a guide to the reader in the study of the subject. It is divided into two parts, the first of which is a general description of the tariff system, and the second is a detailed account of the tariff system in the United States. The first part is divided into three sections, the first of which is a general description of the tariff system, the second is a description of the tariff system in the United States, and the third is a description of the tariff system in the United States. The second part is divided into two sections, the first of which is a description of the tariff system in the United States, and the second is a description of the tariff system in the United States.

The terraces and canyons cut across the foot slopes of the Gallatin range deserve special mention as striking examples of erosion performed by streams marginal to the ice sheet.



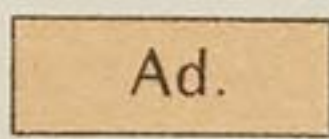


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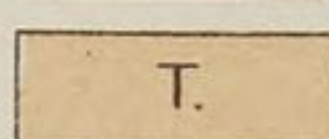
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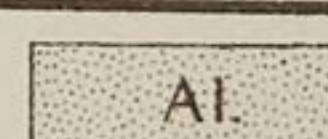
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Assorted drift



T.

River terraces



Al.

Alluvial cones

DISTRIBUTION OF GLACIAL DETRITUS IN THE VALLEYS OF THE YELLOWSTONE.

SCALE. 1 2 3 4 Miles.

CONTOUR INTERVALS 200 FT.

JULIUS BIEN & CO. LITH. N.Y.

THE GLACIATION OF THE YELLOWSTONE VALLEY NORTH OF THE PARK.

BY WALTER HARVEY WEED.

INTRODUCTION.

The local glaciers of Quaternary times, of which evidences abound throughout the highest portions of the Rocky mountain cordillera, attained an unusually extensive development in that broad elevated region known as the Yellowstone Park. It was indeed the center of a considerable ice sheet whose glaciers spread out and down the valleys leading from this mountain region in all directions.¹ In the northern part of the park two streams of ice found an outlet for their united flow northward down the valley of the Yellowstone, and they have left impressive memorials of the power and size of this stream that at once attract the attention of the observant traveler on the way to the famous geyser basins of the park. The number and size of the erratic boulders scattered so abundantly over the valley floor and perched high up on the mountain slopes, can not fail to impress the beholder, while the second canyon of the Yellowstone, known as Yankee Jim canyon, through which the river has cut its way to the broad mountain encircled lower valley, is a grand and perfect piece of ice sculpture that affords striking proof of the power and magnitude of the glacier which once filled the valley.

While studying and mapping the geology of a portion of the country north of the Yellowstone Park, under the direction of Mr. Arnold Hague, and for the United States Geological Survey, I found a long desired opportunity to study the glaciation of this interesting region.

¹See Geol. Hist. of Yellowstone National Park, by Arnold Hague: Trans. Am. Inst. Min. Engrs. 1888.

GENERAL DESCRIPTION OF THE REGION.

The region herein discussed is a mountainous tract lying immediately north of the Yellowstone National Park, and drained by the Boulder and the Yellowstone rivers and many lesser tributary streams. The Yellowstone, rising far to the south, is here a noble stream of beryl green water which is joined by the Gardiner as it leaves the border of the park and flows northward through Cinnabar valley into a narrow gorge cut in Archean gneisses. From this canyon it darts out into a broad mountain flanked valley that is 30 miles long and from 3 to 6 miles wide, fancifully christened "Paradise valley," which it leaves through the lower canyon, or gate of the mountains, a narrow cut in the steeply upturned and folded Paleozoic rocks, to emerge into the great terraced valley that is the beginning of its long course through the Cretaceous rocks. The Boulder river, on the other hand, is a much smaller stream that heads in the snow banks about Haystack peak, and joined by numerous mountain torrents from the neighboring summits flows northward through a narrow canyon with walls 3,000 feet high, to join the Yellowstone in its great terraced valley about Big Timber.

THE YELLOWSTONE GLACIER.

The glacier occupying the mountain valleys of the Yellowstone has for convenience of reference been called the Yellowstone glacier. The ice stream had its source in the confluent ice sheets that covered the northwest portion of the National Park, and flowing northward overrode the lesser peaks about the boundary of that reservation and sent a great ice stream down the valley of the Yellowstone. This glacier, reinforced by a confluent stream from Bear gulch, completely filled the upper valley and extended far up on the mountain sides, completely covering such minor elevations as Cinnabar, Sphinx, and Dome mountains as it flowed northward to the low and broad valley below Yankee Jim canyon. This valley it occupied as far north as Mill creek, a total length of 36 miles from the park boundary. The width varied from 3 to 6 miles, and the depth in Yankee Jim canyon and the valley above it was 3,000 feet. As the névé fields of this great glacier were within the Yellowstone Park they will not be discussed in this paper.

In both the upper and lower of these two valleys this trunk glacier received tributary streams of ice. In the upper valley an ice sheet crept down from the mountainous region to the east, coalescing with another stream of ice from the park that pushed northward between Sepulchre mountain and Electric peak and filled the valley of Reese creek. In the lower valley the main glacier was reinforced by numerous tributary glaciers flowing westward down the great mountain valleys of Sixmile, Emigrant, and Mill creeks, whose united force deflected the northern end of the Yellowstone glacier westward against the foot-

hills of the Gallatin range. The névé fields of these eastern tributary glaciers were the broad and high mountain summits of the Snowy range, each of the larger mountain gorges penetrating this rugged region, having been the bed of a glacier. The evidence shows that the névé fields of these tributary glaciers were of considerable extent and were confluent with those forming the head of the Boulder glaciers.

LIMITS OF GLACIATION.

In mapping the areas occupied by these ancient ice streams it has been found difficult to define the exact limits of the ice upon the mountains east of the Yellowstone, owing to the number of tributary glaciers and the gradual change from glacial to nonglacial topography, while the drift is generally of the same material as the rock upon which it rests. On the other hand, the drift deposits of the valley are readily studied, and the western limit of the drift is sharply outlined by the boulders of gneiss and granite resting upon the rocky slopes of volcanic breccias. The gradually decreasing altitude at which this marginal drift occurs as we go northward from the park shows a rapid thinning of the glacier north of Yankee Jim canyon.

CINNABAR VALLEY.

Both the Cinnabar valley and the surrounding mountain slopes present many interesting evidences of glacial occupancy.

Bear gulch and Sheep mountain.—On the east the tributary glacier of Bear gulch has left a trail of rhyolite blocks from a hill some 8 miles above its mouth, showing that the ice crowded around this corner of the mountain, occupied what is now the head of Eagle creek and merged into the main stream as it overrode the flanks of Sheep mountain. It is a noticeable fact that the slopes of this mountain are abundantly strewn with erratics, particularly about the base, where the slopes merge into the bench made by the basalt and travertine sheets. The foot of these slopes is somewhat heavily mantled with drift, the boulders being of moderate size and consisting chiefly of gneiss and granite, with many of rhyolite from Bear gulch; this detritus is arranged in crescentic loops with small alluvial flats behind them. The bench at the base of the mountain slope is but mildly glacial and free from boulders. A till-like material is found in spots, mantled by gravels, and alluvium from the mountain slopes has largely covered the original glacial deposits if any were present. Owing to the frequency of the small recent faults which have broken and disturbed the bench glacial evidences are largely obscured. Rhyolite drift from the bluffs of Bear gulch forms a train encountered between the bluffs and the ranches of Eagle creek, and none was found south of this road (i. e., between the wagon-road and Bear gulch). The erratics generally are gneissic, occurring in clusters, and very abundant between Eagle

creek and Bear gulch. A very considerable accumulation of massive boulders upon the basalt bench north of the mouth of Bear gulch is supposed to be the work of the receding glacier.

Sepulcher mountain.—The west side of the valley evidences the conflict of the ice streams from the Yellowstone canyon and the Gardiner with the lesser stream coming down Reese creek, which by their union formed the trunk glacier of this valley. The upper slopes of Sepulcher mountain are littered with numerous erratics, the lower slopes in places mantled with glacial gravels and sands or carved into typical glacial hillocks by the abrasion of the ice. The drift accumulations of the mountain flanks are most conspicuous within the borders of the park. West of Gardiner the slopes attract attention by their rounded, mamillary forms, which, upon examination, are seen to be the result of erosion and not due to a covering of drift. The stage road from Gardiner to Cinnabar crosses a typical portion of this area in which the volcanic breccia composing the hilly slope is but scantily covered by drift, yet the topography is strongly morainal in its contours.

The valley bottom.—The immediate valley bottom contains much drift, which in the lower levels is of course terraced by alluvial action. The town of Gardiner is built upon such a boulder-covered terrace, the erratics being chiefly gneiss. Chadborn's ranch to the north is built upon a well-defined moraine of great granite boulders that outline the northern limit of the Sepulcher mountain moutonée forms. The valley bottom in this vicinity evidences various stages in the retreat of the ice sheet. North of Hoppe creek the stage road follows a depression with a level bottom some 125 yards wide between two ridges of boulder drift.

In general the valley has been subject to considerable glacial erosion during the maximum extension of the ice, and the deposits of drift mark phases in the retreat of the ice. Mention should be made of the large deposits of glacial gravels forming kame-hills about the debouchure of Reese creek. The drift is all from the head of this lateral valley and brought by a branch ice stream pouring down the valley from the Sepulcher-Electric divide. From Cinnabar station to Cinnabar mountain the valley bottom on the west is wholly alluvial.

Cinnabar mountain.—The Cretaceous spur of coal-bearing rocks that terminates in the upheaved beds of Cinnabar mountain presents no special features of interest, though drift-covered hills of glacial gravels that accumulated at the base of Cinnabar mountain while the ice was crowding over its summit seem to prove that stagnant portions of the ice filled this place while the main current pushed through the gorge to the north or over the mountain top. Boulders of gneiss and andesite resting upon the stratified beds prove that the ice passed over the summit.

From Cinnabar mountain to Yankee Jim canyon the course of the Yellowstone is northwestward, and that the northward-pushing glacier was

deflected by the high mountains northeast of the river is evidenced by the drift carried from the Cinnabar mountain. The mountain slopes on the east side of the river show considerable evidences of glacial abrasion, benching, and the usual erratic blocks, but were not studied with the same detail as those to the west, which promised more definite and important results, but the drift shows that the ice overrode the slopes to a height of about 3,000 feet above the present stream.

The western side of the canyon, north of Cinnabar, to the gorge called Yankee Jim canyon, presents a different type of glacial erosion.

The present canyon of Cinnabar creek is a post-glacial cut in a bench of granite whose surface presents fine examples of glacial polishing and scoring. A short distance northward the lower slopes are formed of the breccias which have been eroded by the ice. Seen from the slopes of Dome mountain this hilly area presents a peculiarly mamilated appearance. The hills formed of dark volcanic breccia of augitic rocks which when traversed is found to form rough craggy masses with a generally hummocky topography, there being no drainage and sharp basins lying between. It is a combination of glacial topography with post-glacial settling or land slides. Glacial gravels cap many of the knobs, especially east of the road, but erratics are rare. A peculiar feature of the northern end of this area where it runs into the basin at the south end of Yankee Jim canyon, is the fact that these hills run into ridges which are prolonged by glacial gravel. This gravelly drift shows blue quartzite, granite, and many varieties of andesite, but no basalt or rhyolite could be found.

A peculiar, tarn-like lake occupies one of the peculiar depressions in this foothill area, but is not dammed by glacial gravels. The slopes above these hills form the flank of a small elevation known as Sphinx mountain, whose glaciated summit, capped by numerous erratics, is 2,400 feet above the river. The andesitic breccias and basaltic flows forming the southern slopes of the mountain have been eroded by the ice into the characteristic knob and sink contours with very little small drift, though boulders of granite with rarer erratics of sedimentary origin are abundant on flanks and summit. The eastern slopes are somewhat benched, and the northern slope shows a considerable accumulation of detritus forming glacial hummocks resting upon the rocky flanks.

Cinnabar basin.—Cinnabar basin is an elevated mountain park drained by the northern fork of Cinnabar creek. The valley of the main creek is a narrow cut with rocky walls and presents no points of interest in this connection, though evidencing the extent of post-glacial erosion in the walls of its inner gorge. The basin on the other hand is a pre-glacial valley greatly modified by its occupancy by ice and filled by glacial detritus. Looking down upon it from the surrounding mountain walls its smooth contours, pockets, hummocks, and rounded knolls and sinks show very clearly the work of the glacier in producing the

present condition. Of the two streams which drain it the larger heads in a glacial amphitheater under the bold walls of the main summit of the range, and flows through a trenched channel; the other heading in a smaller mountain amphitheater, filled with hummocks of drift, meanders through a broad marshy area flanked by drift hills and gravel flats, and has not cut through the alluvium and drift which fill the valley bottom. These streams uniting form the north fork of Cinnabar creek. A transverse moraine has deflected this stream, where it joins Cinnabar creek, and forced the waters to cut a channel through gneiss, thus retarding the down-cutting of the stream above.

Transportation of boulders to a higher level.—The high mountain ridge that forms the western wall of Cinnabar basin was covered by the ice to a height of 8,000 feet, the drift terminating abruptly at that elevation. The boulders of this locality evidence an interesting example of the transportation of material from a lower to a higher level. At 7,400 feet the boulder drift contains, besides the usual types of granite, gneisses, etc., many blocks of limestone and Dakota conglomerate, whose only source is Cinnabar mountain. None of these boulders occur at lower levels, and as there is but one source it proves a movement of the ice over Cinnabar mountain westward. These boulders are five and a half miles west of and 350 feet above their highest possible source. Boulders of pink quartzite and shaly Cretaceous sandstone occur on these same slopes at a higher level. These boulders furnish absolute evidence of the crowding of the glacier westward by the bend in the valley. As the constricted river gorge could hold but a small part of the glacier, the ice was forced to override Cinnabar and Sphinx mountains and filled Cinnabar basin, leaving a record of its margin as high as 8,000 feet on the western slopes. These western slopes which were not ice covered in turn deflected the ice stream, which in its course northward gouged out the beautiful little glacial valley followed by the trail from Cinnabar basin to the lower Yellowstone. At the south end of this cut the hammocks are of glacial drift. Two lakelets occupy depressions in its bottom, being confined by drift, but detritus is not abundant, consisting of scattered erratics, mostly of gneiss, with a few of andesite upon the adjacent slopes of volcanic breccia. The northern end of the cut is occupied by a small stream called Teepee creek, heading in a lakelet fed by a clear spring of water. The creek is actively cutting down a gorge in the mountain side, but does not follow the old course of the ice, which here crowded around the shoulder of the ridge separating Cinnabar basin from Tom Minor.

YANKEE JIM CANYON.

Yankee Jim canyon presents a very perfect and striking example of the eroding power of ice and of glacial sculpture.¹ It is a narrow gorge cut by the Yellowstone in metamorphic gneisses, through which the

¹ A charming description is given by Sir Archibald Geikie; see *Geological Sketches*.

river rushes in a torrent of beryl green quite unlike the placid stream above. The glacier which once filled this canyon and overflowed its walls has broadened it and rounded, planed, and polished its sides from bottom to top. The eastern wall, formed by the sides of a low, rounded knob known as Dome mountain, shows striated surfaces and ice-worn bosses, dotted with erratics almost to its summit. On the west the slopes above the polished surfaces of the immediate canyon wall are ice worn and are carved into typical glacial ridges and moutonnées, with a general bench structure to a height of 8,000 feet, or 3,000 feet above the river. Indeed, knowing the activity of disintegrating agencies in a climate where frost is an almost nightly visitor during the summer months and the winters are long and rigorous, it is surprising to find these evidences so fresh.

Erratics of gneiss are conspicuous wherever the surfaces have permitted their lodgment, and dot the ice-worn bosses at every altitude, so that it is certain that the glacier was 3,000 feet thick at this place and proves that this ancient glacier of the Yellowstone was of greater magnitude than has been ordinarily supposed.

The extreme erosion at this point of its course by the old glacier was due no doubt to a considerable contraction in its width, coincident with a narrowing of the valley bottom more than one-half, whereby a large part of the ice was forced to rise upward and override the higher slopes.

The morainal ridges of drift, the ice-worn bosses, and the erratics in the sag east of Dome mountain prove that a considerable portion of the ice, unable to crowd through the gorge, found an independent entrance into the broad lower valley of the Yellowstone. The sag itself shows considerable accumulations of detritus, forming benches and elongated ridges running north and south. Erratics were observed as high as 8,100 feet upon the spur east of this sag. Their absence above proves this to be the limit of glaciation.

EMIGRANT VALLEY.

Before passing through the lower canyon, the so-called gate of the mountains, to the broad and low valleys of the lower course, the Yellowstone flows through a broad valley, encompassed by mountains upon every side, a grand and beautiful intermountain basin, 30 miles long and from 3 to 6 miles wide. On the west the slopes rise gradually to the castellated crests of the Gallatin range; on the east the high pinnacle of Emigrant peak overshadows the valley, while the spires of Mount Cowen and its neighbors form a serrated wall, shutting in the northeastern part of the valley. Broad alluvial bottoms, with inter-osculating channels and islands bright with cottonwoods, mark the river's course. The broad terraces on either side are cut by numerous tributary streams issuing from their mountain gorges, supplying occasional farms, whose bright stretches of grain and tilled fields intensify

the contrast between the fertile valley and the barren wilderness of the surrounding mountain slopes.

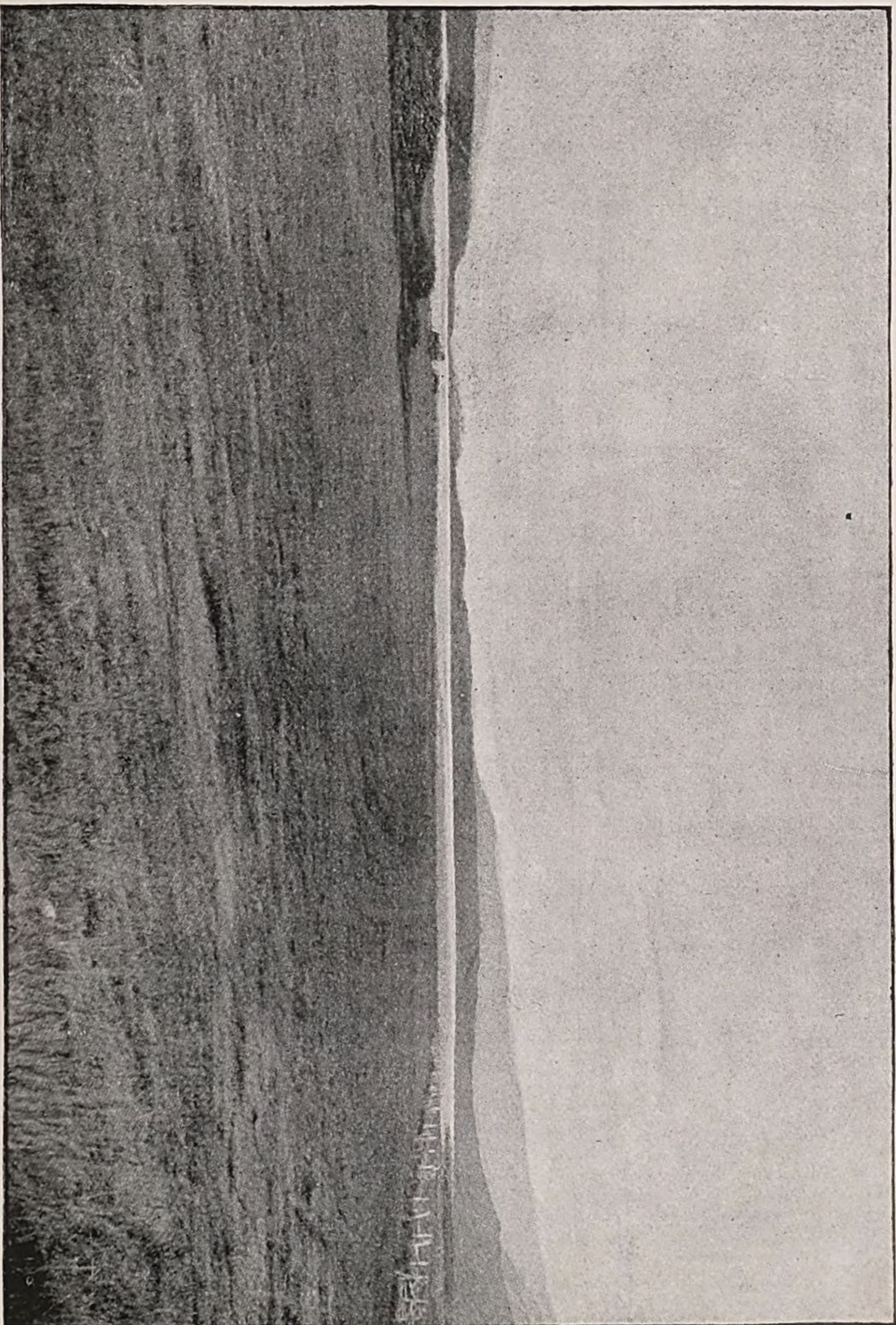
The geological observations hitherto made in this valley led the earlier geologists to suppose it to be the bed of an extinct lake, and the lake beds preserved beneath a protecting sheet of basalt show that such was once the case. A later episode in the history of the valley, and one that has given it its present surface, was the extension of the Yellowstone glacier northward, filling the southern half of the valley and depositing the glacial detritus, covering the higher levels and the gravels of which the great alluvial terraces are built.

The glacial stream confined within the narrow gorge of Yankee Jim canyon and the adjacent mountain slopes spread out and filled the broad bottom of this valley, depositing much of the detritus which the ice had transported from the mountains. These morainal accumulations are most interesting upon the eastern side of the valley, where considerable areas are covered by drift hills and kames, with abandoned channels of subglacial streams, and a chain of morainal lakelets add their charm to this peculiar scenery.

Upon the west side the immediate valley bottom is formed of alluvial terraces and the detritus of streams from the mountains, while the adjacent slopes are boulder strewn and marked by a very striking and peculiar system of terrace lines.

Mountain canyons.—As the structural geology of the mountainous region to the east of this broad valley was studied by Mr. J. P. Iddings, I am indebted to him for notes upon the glaciation of the deep gorges which held large ice streams tributary to the trunk glacier of the Yellowstone. These glaciers pushing out and across the valley left their drift upon the extreme western margin of the glaciated area near Fridley's. All these mountain valleys show in their rounded slopes and ice-worn rocks and their general broadening that they have been sculptured by the ice streams they once held. (See Pl. III.) That these streams were of considerable size and thickness, is proven by the height to which the ice-worn bosses and ice-borne erratics have been found upon the mountain slopes. At the head of Sixmile creek a granite boulder was found resting upon volcanic rocks at a height of 9,500 feet, thus proving that the glacier not only filled the great amphitheater at the head of this stream, but overrode its high encircling walls.

Morainal heapings.—The southern part of this great intermountain valley is covered with a superficial deposit of glacial drift that marks the area occupied by the ice. On the east side of the Yellowstone these morainal accumulations extend from the mouth of Yankee Jim canyon northward beyond the debouchure of Mill creek, interrupted only by the terraced drainage cuttings made by Sixmile and Emigrant creeks. As a whole this material is heaped into a tumultuous assemblage of knobby or mammillary hillocks with correspondingly sharp depressions, and the material is both unassorted and of kame-like stratification.



DUCK LAKE, A MORAINES-DAMMED SHEET OF WATER.

Morainal lakes.—A noticeable feature of the topography of this part of the valley is a chain of lakelets lying in a well defined depression between the base of the mountains and the drift-strewn summit of the basalt table. The largest of these bodies of water is known as Duck lake (see Pl. II), and, with its companion lakelets, belongs to the type of lakes due to dams of morainal material. This is perhaps most plainly shown in the case of the middle lakelet whose scalloped lobate form is due to the fact that the lake fills several adjacent morainal hollows. The drift is mainly small and partially assorted, forming typical kames.

East of these lakes a lateral moraine composed of quite large boulders and more angular debris, largely of blocks 2 to 10 feet across, forms a prominent ridge running northward along the mountain side west of the stream tributary to Duck lake. It is the work of the ice as it spread out into the valley from the narrow bed of the canyon above and consists of fragments from the walls and slopes of Yankee Jim canyon.

Duck lake itself is a pleasing sheet of dark blue water, oval in outline, and forming an agreeable change to the eye after traveling over the monotonous moraine. The water is somewhat opaline at the windward side, the northern shores being gravelly beaches, showing a high water line some $2\frac{1}{2}$ or 3 feet above the present level of the lake (in September). At the south end the shores are muddy and form the termination of a somewhat extensive marshy bottom that fills the depression between this lake and the smaller body of water to the south. The large drift is much more abundant immediately north of Duck lake than it is farther away.

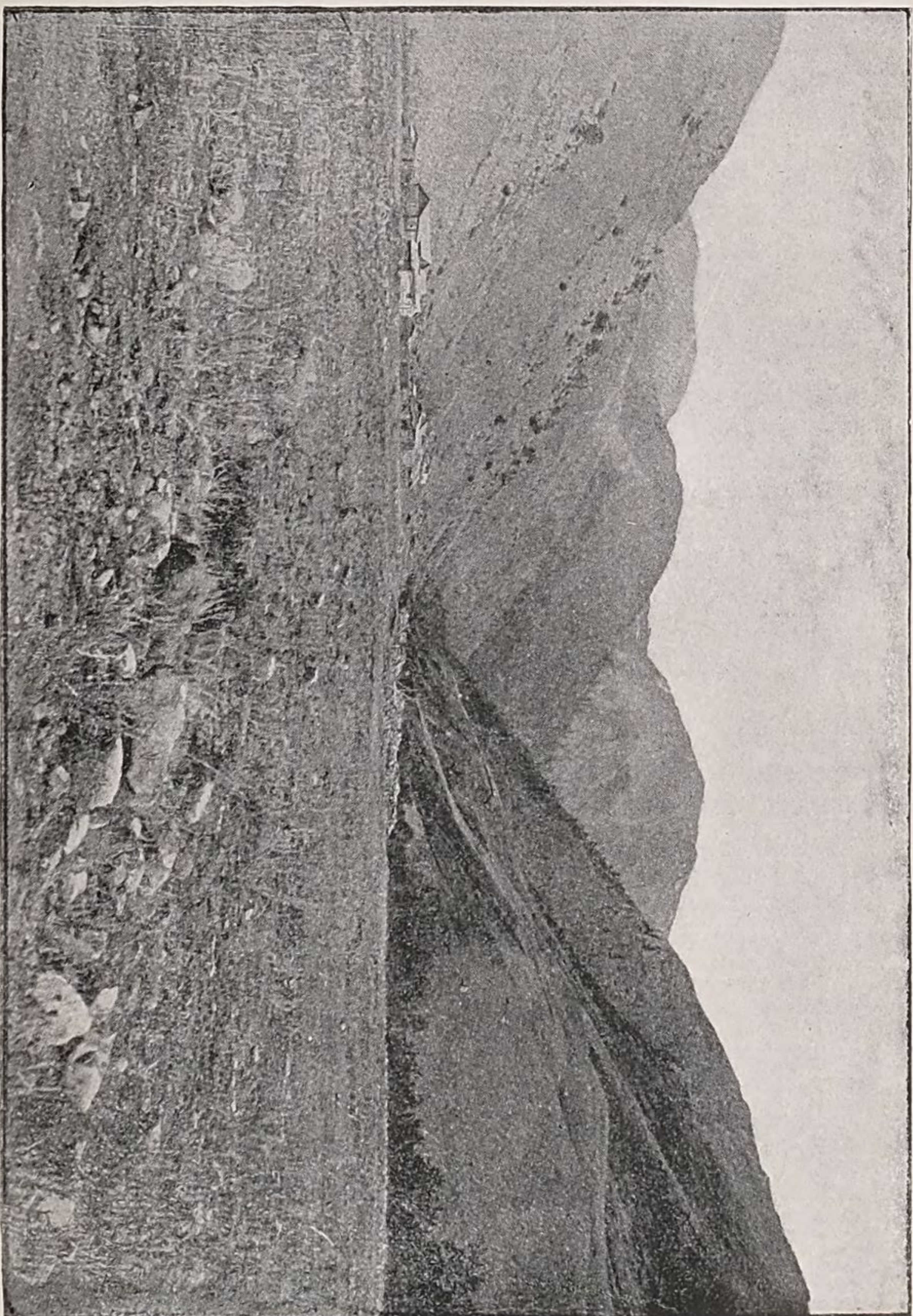
North of Duck lake the wagon road follows a shallow, alluvial flat, separated from the bed of Duck lake by a train of detritus brought down by small streams from the adjacent mountain slope. Beyond this flat the kames attain their most characteristic development, consisting of gravels and sand rudely assorted and forming hillocks 15 to 20 feet high, capped by cobbles and boulderlets chiefly of gniess and separated by sharp sinks and kettle holes. The road follows a gentle grassy depression formed by a glacial stream running to the northwest. This channel once held a good sized stream whose waters were burdened with silt and sand, with which it built up the terraced sides of the present grassy draw. That it is not an old channel of Sixmile creek is evident from its situation and the fact that such a stream would not desert so well formed a channel, and, furthermore, by the presence of an area of hummocky drift hills separating this old creek bed from the present drainage channels of Sixmile creek.

Sixmile creek at present flows in its old bed. A newer channel, now dry, being found on a terrace above the present creek marked by a line of cottonwoods and evidently occupied for many years. The broad gravel flat which now carries the water has been made by a stream

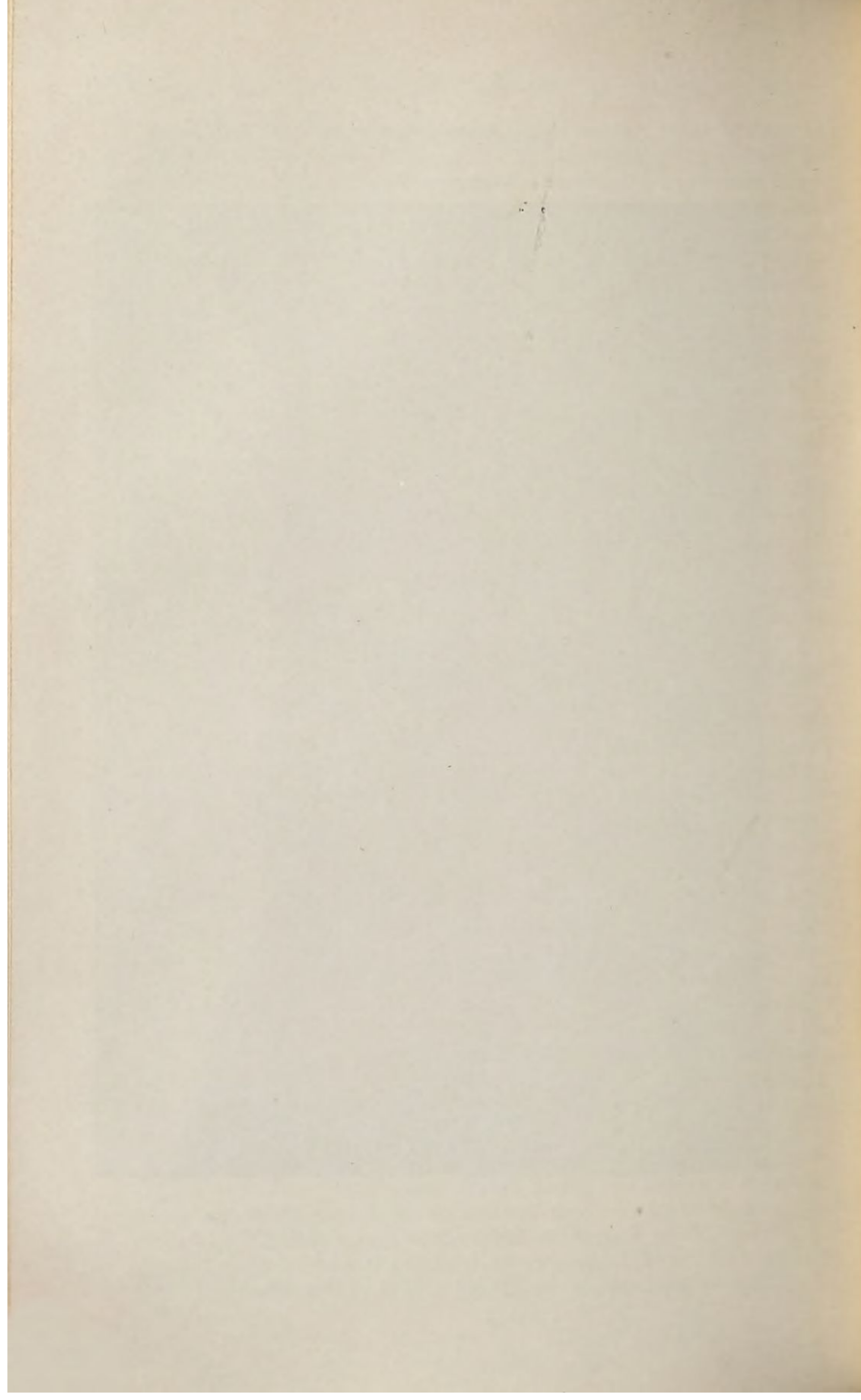
much larger than the present creek, being in fact large enough to accommodate the Yellowstone itself. Between this channel and the basalt table to the west there is an area of morainal drift of some interest. A terrace about a quarter of a mile wide separates these morainal hills from the immediate gravelly flat of the creek, and the moraine terminates in the rear of this terrace in a steep boulder slope very difficult to climb. The summit of the moraine is fairly level, thickly strewn with basalt boulders from the basalt sheet to the west, with occasional erratics of gneiss and limestone. The boulders average 2 to 3 feet in diameter and some 2 or 3 feet apart, resting upon smaller cobbly material. Small sandy benches occur occasionally, marking the site of small marginal streams. The north slope of this moraine is gently undulatory and knobby, while the southern slope is free from knobs and sinks, being a fairly level surface falling gently to the southwest, toward the old glacial stream channel heading in the moraine near Duck lake and holding a small alkaline lakelet. There is a noticeable decrease in the size of the boulders as we go westward over this moraine. Between Sixmile and Emigrant creeks the moraine is a very gently accentuated knobby area, the hummocks rising but a few feet high, with many sandy level areas and a general inclination to the west of the entire area.

North of Emigrant creek the country is nearly similar to that just described, being but mildly morainal, the drift mainly under 12 inches in diameter and the larger boulders being half buried in the smaller gravelly debris. Large boulders are, however, frequently seen, with typical erratic form, striated sides, and beautifully polished, glistening surfaces. One fine intermorainic hollow was crossed that evidently served at one time as a temporary channel for a subglacial stream. This channel is 75 yards wide and heads in the drift hills. Beyond this channel the hummocks to the north are very rough and form a strip of country extending northward to a second subglacial channel heading in these hummocks and but 25 to 50 yards wide. Beyond here the hills are gently contoured, but typical in form and extend to the broad depression holding the lakelet shown upon the map. This depression is part of the glacial flood plain. Beyond the lakelet a narrow strip of moraine extends parallel to the river, nearly to the mouth of Eightmile creek, being separated by a broad, sandy terrace from another area of morainal debris, forming the hummocky lands lying at the base of the mountain slopes just south of the debouchure of Mill creek.

Basalt tables.—The central part of the valley is occupied by a mesa of lake beds capped by basalt. This forms two separate areas, of which the largest is on the east side of the river and extends from Point of Rocks northward to the mouth of Sixmile creek. The table is about 6 miles long and 3 miles wide, its summit being about 250 feet above the surface of the river. The top of this mesa shows occasional



MOUTH OF EMIGRANT GULCH, SHOWING GLACIATED MOUNTAIN GORGE OPENING INTO YELLOWSTONE VALLEY.



bare surfaces of the basalt generally as low domes of rock, 10 to 50 feet wide and 50 to 100 feet long, the basalt being smoothed and striated, the groovings running parallel to the river. These domes of rock are generally scantily scattered with boulders. The summit of this basalt table shows in its striated and polished surfaces and its low moutonnée contour that it has been subjected to considerable glacial erosion. The retreating ice sheet has strewn its surface with boulders and smaller glacial drift.

A thin mantle of drift, however, generally conceals the surface of the basalt. At the northern end the slopes are thickly scattered with boulders of granite, black mica schist (rare) and occasional blocks of creamy white limestone, while a large proportion of the drift consists of basalt boulders. The northern and western edges of the mesa are surmounted by sharp ridges of drift that rise 15 to 20 feet above the undulating sinks and swells of the general surface. A train of boulders forms a ridge crossing the table to the southeast, and the general surface is paved with cobbles, the space between filled with small drift. In the central part of the table the boulder ridges are well defined, running north and south with long narrow grassy depressions between. These hollows form a conspicuous feature of the summit; being filled with sand and alluvium and well grassed they form excellent pasture grounds that extend for a mile or two south, running into a confused heaping of drift with knobs and with small and disconnected sandy flats between.

The character of the drift covering the basalt table has already been indicated in the preceding paragraphs. The large boulders which are particularly abundant upon the northern portion of the table contain a considerable variety of material in which basalt, identical in all respects with the rock beneath the drift, predominates. Boulders of gneiss and schists are abundant, and occasional blocks of white quartzite and of pitted paleozoic limestone are very conspicuous. The glacial striæ show a movement down the main valley.

Glacial stream channels.—The existence of considerable streams flowing from the ice front is established by the many channels and sandy terraces associated with them, which cut across the drift hills or head within the morainal area. Besides these channels, formed by temporary streams flowing from the ice front, the streams from the east, notably from Sixmile and Emigrant gulches, have not always occupied their present beds, but in glacial times flowed in channels subsequently abandoned upon a recession of the ice or its complete disappearance. Thus the present wagon road from Findley to Chico follows a well defined and broad water course, cut in the sandy moraine and heading in a broad sandy plain at a level with the summit of the moraine and some 75 feet or so above the present bed of Emigrant creek. All traces of the stream channel end in this sandy

terrace, which was the flood plain of the creek at the time the Emigrant gulch glacier had retired within the walls of the gulch. This channel was subsequently abandoned because silting up afforded an easier outlet for the water in the present course which has been cut down and forms the present channel of the creek.

Two small channels produced by subglacial streams have already been noted in describing the moraine north of Emigrant creek, but such channels are numerous. One of the largest, a rather shallow waterway with sandy terraces cutting the glacial flood plain and running north parallel to the road from Chico to Mill creek. Two cut deeply in the moraine south of Elbow creek, and others occur in the moraine area south of Sixmile creek. The deflection of Sixmile creek to the northward into the valley is caused by the accumulations of drift.

The largest of these glacial stream channels is probably that which lies back of the basalt table, a broad river bed heading in a low divide in the moraine above Duck lake, and extending down to the Yellowstone opposite Boettlers. It opens out into the great alluvial or gravel flat of Sixmile and Emigrant creeks, above which the moraine ridges rise with steep scarp slopes.

Another very marked channel lies east of this last and runs parallel to it, heading in a sandy terrace flat some 75 feet above and near the north end of Duck lake. This glacial (or subglacial) stream channel is one-third of a mile wide in its broadest part, with flat sandy bottom showing no water channeling. Near Duck lake the side walls of the coulee show longitudinal ridges or embankment-like heapings of boulders. The floor of the depression is usually entirely of sand, but as the head of the ancient channel is approached the sand becomes coarser and grades into fine gravel which in turn becomes larger nearer Duck lake. In the lower part of the coulee boulders are quite rare, but become more plentiful near the head. As is the case with the other ancient channels noted this one heads in sandy flat or plain in the moraine.

Drift deposits.—Upon the western edge of the river there is only a narrow strip of valley between the river and the foothill slopes, and this is entirely occupied by alluvial terraces from Tom Minor creek to Big creek. From Daileys to the northern limit of the drift, near Eight-mile creek, the moraine covers the higher portion of the valley bottom above the alluvial terraces, presenting the usual types of conical hills of drift with an abundance of boulders, many sandy flats and deserted subglacial stream channels. As already stated, the margin of the drift is readily traced upon the volcanic breccias forming the bare rocky hillsides which inclose the valley on the west. On the ridge north of Rock creek there is a well defined drift-covered bench at 7,740 feet. On both sides of Big creek the upper limit of the glacial detritus is about 6,800 feet. North of here the elevation rapidly declines until

west of Fridleys the drift covers the low triangulation hill, beyond which it is limited to the valley bottom.

Terraces.—In the southern part of the valley these drift-strewn hillsides are characterized by a remarkable terracing of the slopes particularly prominent about the debouchure of Dry creek. The great terraces of Tom Minor basin and the equally definite terraces of Rock creek and Big creek, also lie within the limits of the drift and are coincident with the occupancy of the valley by the Yellowstone glacier. Several significant facts lead to this belief: These great benches are best marked where tributary valleys join the Yellowstone; they occur only upon the western side of the old glacier, and near its margin; they always occur within the boulder-strewn area, and never above the limit of the drift, and they are cut in horizontally bedded volcanic breccias. The size of these benches will be appreciated by a look at the map showing their development about Big creek—a locality where they attain a very prominent development. On the north side of Big creek such a terrace forms a beautiful flat-topped grassy open bench, a mile wide. The surface has a slight gradient toward Big creek, and also to the east, passing imperceptibly upward into the mountain slopes in the rear. Boulders are very abundant upon the eastern portion of this bench, and on the slopes immediately above it, but are rare west of the first fork of Big creek. This fork and the one to the west, have cut deep trenches in the bench, exposing sections showing that it is formed of andesitic breccia covered by drift, the latter being seen to be as much as 100 feet thick in certain places. The bench is continuous eastward to the valley of the Yellowstone; seen from the higher slopes to the south it is a broad flat, with the slope above it faintly lined by two narrow terrace-like markings, of which the uppermost corresponds to the upper limit of the glacial drift. No such bench was detected upon the spur south of Big creek; but granite boulders resting upon the basaltic volcanic breccia show that the upper limit of the drift has about the same elevation.

Similar benches are extremely prominent in the basin of Tom Minor creek, and occur, though of much less extent, in the sides of the valleys of Rock, Dry, and Stricklin creeks. The Rock creek benches, though less extensive than those of Big creek, bear a similar relation to the drift. At this place the uppermost bench is the best defined, and corresponds to the upper limit of glacial detritus. The surface is fairly level, with pit-like hollows and occasional knobby hillocks rising above it, the general surface being covered with fine gravel and sands and occasional boulders, in marked contrast to the bare, driftless slopes above. Below this bench the slopes show rugged steeps of breccia, proving considerable post-glacial erosion, though drift is abundant, both as boulders upon well defined rocky benches and as ridges and groups of hills formed of glacial gravels. On the south side of Rock creek there is a narrow bench scoring the mountain slope and continues for several miles, though cut by drainage channels. This bench

marks the upper limit of glacial drift, 7,800 feet, and is generally emphasized by a channel-like depression on its rear surface.

Striated valley slopes.—Associated with the great terraces just mentioned is a wonderfully fine series of terrace lines scoring the slopes below the limits of the drift. Back of Dailey's thirteen beautifully marked steps can be counted on the slopes west of the valley as shown in Fig. 1. It is at once apparent that these terrace lines are not part of a system of lake terraces. Their lack of horizontality, their lack of relation to other terraces puts this beyond doubt, and shows that they owe their origin to some other agency, either the ice sheet itself or marginal streams. These benches occur about the debouchure of Stricklin creek, where the higher lines form prominent scorings upon the slopes. They are all grassed and show no precipitous scarp. Their connection with

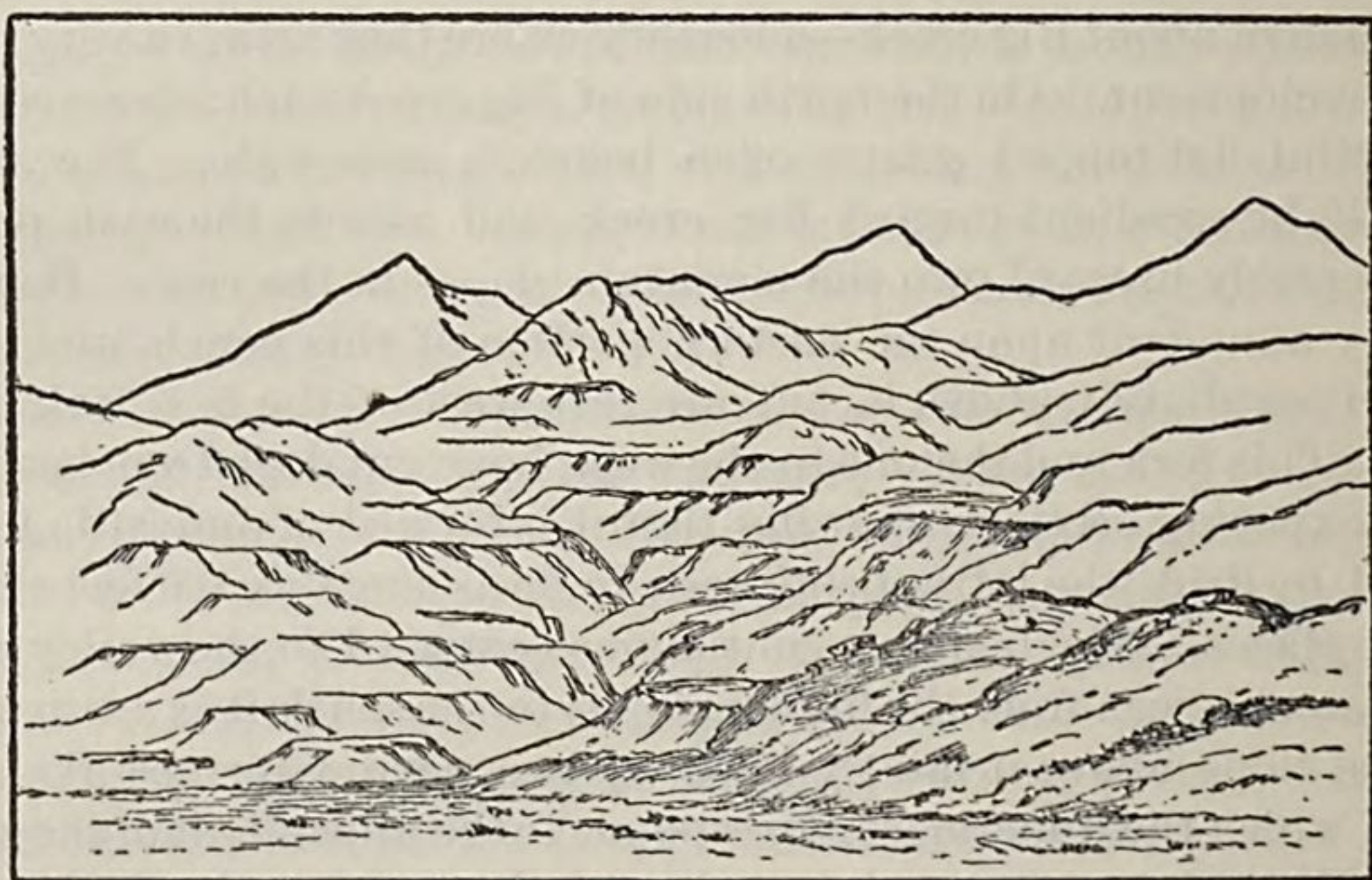


FIG. 1.—Glacial terraces of marginal area, valley of the Yellowstone (Geikie).

the great benches of Tom Minor, Big creek, etc., was a subject of inquiry, and it was found that the higher terrace lines about Dry creek follow the slopes around and run into the great benches of Big creek. Such at least appears to be the case when seen from the edge of the basalt table east of the river. The lower terrace lines do not show in the Big creek canyon, in fact would not be expected to, but the slopes about the debouchure of Big creek show definite and well marked terrace lines, only less prominent than those of Dry creek. To the south the higher bench lines show very markedly on the slopes south of Big creek, though uneven and lacking the beautiful uniformity of the Big creek benches. The slopes up to 400 feet above the river are generally hummocky hills, of breccia, with intervening sinks, resembling in a general and distant view a mammillated surface, in which the hummocks are quite large. Granite boulders are abundant, and occur up to 10 feet in diameter. North of Dry creek the lower benches fade out in these slopes, the higher lines, corresponding to the faint lines seen on the slope

north of Big creek, forming a prominent grassy bench above the mam-millated contours of the breccia foothills and below the steep mountain slopes. This bench expands into a Δ -shaped area on the south side of Stricklin creek.

These strongly marked terraces, which form such prominent features of the slopes inclosing the valley on the west, have no counterpart on the east side, where the moraines show an entirely different phase of glacial activity.

While these terraced slopes characterize the southern portion of the morainal area west of the river, where the valley bottom is low and occupied by alluvial terraces, the valley widens out north of Dailey's, and the morainal drift covers a gradually lessening portion of the foothill slopes, until west of Fridley the margin of the drift lies at the foot of the slopes.

In general, the morainal areas of the valley bottom are similar to those found upon the eastern side of the valley. Rolling hummocks of unassorted drift predominate, while there are many ridges of morainal gravel having a north and south trend with channel depressions between. There is a considerable variety of boulder drift largely gneissic, but containing also some sedimentary material.

The basalt table of the eastern portion of the valley is represented here by much smaller and detached portions of the same sheet, also covering lake beds which, in this case, are shore deposits. This northern portion of the basalt sheet forms a narrow table north of Van Horn's, a mesa whose summit is a quarter of a mile broad, extending from Sheep creek north to the marsh back of Fridley. The level top is scantily strewn with drift, usually all small, only two large erratics being found, both at the extreme northern end. The drift is mainly andesitic, though white quartzite is prominent in the detritus covering the south end of the table.

The northern part of the morainal area shows a somewhat prominent terracing of the surface in general, though the upper benches are quite rolling. Large erratics are not very abundant, and are generally, though not always, found on knolls formed of smaller boulders. There are many sandy alluvial flats and shallow basin areas, having no connection whatever with existing drainages. About a mile north of Fridley's the terrace bluff is cut by an old river channel, a distinctly marked waterway, with general northerly course and an elevation of 170 feet above the present wagon road. A morainal ridge with rolling surface lies between it and the terrace scarp to the east. Westward a bank of water-assorted gravel marks its borders. The surface of a higher terrace 230 feet above the river shows a drift moraine modified by water.

Foothill canyons.—A most curiously interesting feature of the drift-covered area is the presence of transverse canyons cut in the breccias directly across the slopes of the foothills. Their constant relation to

the ice margin suggests that they had their origin during the period of glacial occupancy of the valley. They are of considerable length, sometimes presenting several miles of unbroken walls. Their general direction is a most striking anomaly in the general structure and topography of the neighborhood, for the canyons cut across the slopes sometimes in apparent indifference to deeply trenched drains and rocky spurs alike.

In descending, the foothills which lie at the base of the Gallatin range west of Fridley and form the western boundary of this beautiful mountain valley, a remarkable tranverse cut or gorge is encountered just before reaching the hummocky surface of the valley bottom. This gorge is cut directly across the slope in the rudely bedded volcanic breccias with their intervening sheets of basic lavas. The walls are generally sharply defined, vertical, or nearly so, and show fine exposures of the rocks above a sloping pediment of talus blocks. In height the wall varies considerably, but frequently rises over 100 feet above the bottom of the canyon. The width varies also, but is usually from 50 to 200 yards from wall to wall, the bottom being more or less narrowed by the talus slopes which encroach upon it, and in places completely cover it. One more or less continuous cut was followed from the mouth of the second gulch south of Eightmile creek, south about 5 miles to Stricklin creek. Sometimes there are two or even three parallel canyons, in which case the highest is the largest and longest.

A peculiarity of these canyons is that they can not be seen from the valley, and when approaching the foothill slopes would not be noticed even upon close inspection until actually encountered. They form admirably sheltered refuges for the cattle pastured upon the neighboring hills, and have in the past served the same purpose for bands of bighorn and buffalo, both of which have been slaughtered here in great numbers, as is proven by the numerous skulls.

Only the very largest of the foothill stream channels cut across the upper canyon, while the smaller gulches open into it, the opposite wall being unbroken or marked by a slight depression. This peculiarity is best illustrated by giving my notes upon a portion of this canyon, which was followed for the purpose of ascertaining its extent and its origin.

Entering the north end of the gorge, at the mouth of the gulch south of Eightmile creek, it is at once evident that we are in a cut of most unusual structure. It is about 100 yards wide from wall to wall, the rocky ledges being 40 to 50 yards above its bottom, with sloping bases of talus loosened by frost from the vertical faces above.

The canyon bottom is fairly level between these talus slopes, and generally soiled and grassed, but varies much in width; at first it is narrow, some 25 to 30 yards across, but farther south it widens to 100 yards or more, extending as far as the mouth of the first gulch, cutting the slopes and western wall. This gulch is the bed of a stream, now

dry, belonging to the normal drainage system of the foothills, and is the trunk of a ramifying system of deeply trenched little channels draining the slopes to the west, but all dry at this time of the year. The stream channel opens into the transverse canyon we have followed, but does not cross it, and in time of flood its stream must of necessity find its outlet through the canyon northward. Opposite the debouchure of this dry drainage way the east wall is unbroken, and about 100 feet high, a little less than it is farther north.

South of the lateral gulch just noted the canyon continues unbroken, but the walls approach nearer together, the bottom is filled with talus, and progress is difficult. The walls are here neither so high nor so precipitous as to the north. Half a mile to the south the walls recede, and the canyon bottom widens out to 150 yards, having a flat alluvium bottom, in the middle of which a rocky butte stands up some 15 feet high, like an island, in the flat. A sag in the eastern wall, some 10 feet above the alluvial flat, has at some time permitted the escape of the pent-up waters poured into this part of the canyon by a considerable gulch cutting the slopes a short distance west. It is this gulch which contributed the alluvial material forming the flat. The main canyon cutting extends up to and runs into the mouth of this gulch—a significant fact, if the drainage marginal to the ice sheet had anything to do with the cutting of this transverse canyon.

Following around this deflection of the canyon we observe that the foothill drain has not cut across the transverse canyon, its east wall being here 200 feet high, but has deflected it.

South of this gulch the canyon, though continued the same direction, is detached from the part already followed, and opens out to the main valley by a sag in the east wall. To the south the talus has filled up the canyon bottom, so that there is a rise of 50 feet. The walls are here only about 40 yards apart, and the talus forms inclosed basins of the canyon bottom. The west wall is a sheer face of breccia and basalt 125 feet high, with talus slopes overgrown with grass; the east wall is not so high, but as usually the case forms the highest part of a slope running gradually, often steeply down to the general slope of the morainal area. Here this slope was found to be cut by a smaller canyon parallel to and quite like the larger one which was followed, though it is but 25 feet deep and runs out in the knobby drift area to the north.

Throughout the length of the canyon so far examined, some three miles, there is a noticeable absence of stream gravel in the canyon bottom, except where quite clearly brought down by lateral gulches. Glacial drift is often entirely absent; sometimes occurs scantily in the canyon bottom, and very rarely was found on the immediate slopes west of the canyon. The next gulch to the south is the third thus far encountered, and the channel of a stream draining a considerable area of the slopes to the west for several miles back, in which it has cut a

gorge 300 to 400 feet deep. At the mouth of this gulch the east wall of the transverse canyon is breached by a broad depression opening into the valley. To the south the canyon continues, but is rather narrow, and the walls, 100 feet or so in height, are flanked by much débris, often completely filling up the bottom of the gorge. About a mile to the south the canyon opens out into a flat some 200 yards, more or less, in diameter, the basin being separated from the main valley by a low sag in the east wall some 15 feet above the flat. South of this flat the canyon divides about a pillar of rock some 25 feet high and uniting continues, with walls somewhat diminished in height, to the first creek channel north of Stricklin creek, where it opens out into a gravel terrace with steep bowldery scarp 135 feet high. This dry creek is the largest drain thus far encountered, and it opens out into a well-defined alluvial cone, sloping gently to the east, and running into a flat that is part of an old river channel, and confined by morainal hills of drift, 25 to 30 feet high, on the east. Curious to see if the transverse canyon continued farther south, the alluvial flat was crossed and a continuation of the same canyon found and followed to Stricklin creek.

Relations of canyons to drift.—The relation of this transverse canyon to the glacial drift is most pertinent. It was noted—

First. That the slopes west of the canyon were bare of drift, and had not been covered by ice—this was positively established; in only one instance was any drift observed west of the cutting, and the bowlders formed a strip but a few yards wide.

Second. Drift is generally absent from the canyon itself and, if present, only in small amount.

Third. The slopes east of the canyon are heavily mantled with drift, both in the form of bowlders and as smaller material.

Fourth. This drift comes from the east, being gneiss and white talcose rock from the Snowy range, hornblende andesites, and sedimentaries.

Observations of the slopes east of the canyon were made at various points, and always showed the drift extending up to the very edge of the east wall of the canyon.

The larger drift was often found to be arranged in morainal ridges, running parallel to the canyon walls, and passing gradually into the more common knobs and sinks. As already stated, the slope east of the canyon is frequently trenched by shorter and smaller parallel depressions cut in the breccia. The morainal drift of the valley generally forms typical drift hills, rarely 25 to 40 feet in height.

Origin of transverse canyons.—After a careful study of these cuttings in the field I am still in doubt as to their origin. A recent faulting at first seemed most probable, and a resemblance to the fault fissures in the travertine and underlying basalt east of the river about Gardiner made this seem probable. Yet this type of canyon would not result from normal faulting, which would produce a single fault scarp. The

bottom is, moreover, filled in a manner rather incompatible with this theory.

On the other hand the temporary character of streams flowing about the margin of ice sheet, scarcely warrants the belief that the canyon has been cut by such streams, even if aided by the drainages of the adjacent slope. The work necessary to cut down 100 or more feet across these transverse slopes, and through hard basalts and indurated, though easily eroded breccias, is not very onerous, and is easily performed to-day even by very small streams, but seems nevertheless to require more time than the existence of marginal streams could supply.

Glacial flood plain.—North of the limits of the drift, the valley bottom is filled with the glacial flood plain, largely terraced by the Yellowstone, but still retaining areas of its original surface. This plain has an elevation of 150 feet above the Yellowstone and opposite the mouth of Eightmile creek is an almost absolute level, the upward slope toward the moraine being very faint, as shown by a hand level, which gave a rise of only 8 feet or so in a mile. This is perhaps the most typical part of the morainal apron to be found in the valley. It is a flat extending from Mill creek to the Yellowstone opposite Chicory. An old glacial channel runs into it from the south, and the plain extends as far as the hot spring near Chico. On the west side of the river the alluvial gravels of Eightmile and of Trail creeks have obscured in part the great morainal apron, but its level surface appears north of Chicory, forming the great bench crossed by the wagon road and above the railroad terrace. The most striking view of the termination of the moraine is obtained from this plain, near Hayden—the foreground, of level hay fields, with water courses intensified by low groves of willow; a plain beyond, extending to the abrupt slope of the moraine front, whose sharp crested line of hills forms the background. Approaching the moraine, the surface of the plain is seen to be covered with rounded and smooth cobblestones, evenly distributed at some distance from the moraine, but arranged in channels near the hummock hills.

The moraine front rises abruptly as steep hills, with boulder strewn fronts, no boulders being seen on the overwash plain. No sand is seen on the surface of these moraine hummocks. The wagon road up the valley enters the moraine before crossing the middle branch of Eightmile creek, and passes an intermorainic hollow or channel, 250 yards wide, between the two ranges of terminal moraine hills, a second chain of hills being crossed by the road before reaching the modern channel of Eightmile creek.

Alluvial terraces.—North of the moraine of the Yellowstone valley, and beyond the immediate apron forming the moraine front, the valley is filled with morainal gravels, in which the river has cut well defined terraces. The best examples of river terracing occur within the morainal

drift area, especially about Fridley. Immediately back and west of that settlement the valley presents series of alluvial terraces, the highest 160 feet or so above the river, but the moraine forms well defined terraces, with rolling hummocky surface at 170, 190, and 230 to 240 feet above the town.

Opposite the railroad station called Chicory there are three well marked river terraces at 25, 50, and 150 feet, respectively, the uppermost being the morainal apron or flood plain. The same terrace appears on the west side of the river, to the north of Eightmile creek.

In the lower valley, local ice streams from Elbow, Barney, Pine, and Deep creeks formed moraines extending down their canyons and forming prominent ridges about the debouchure of the creeks, particularly Pine creek, where the moraine comes down to the road. As a whole, however, this eastern side of the valley shows no terracing, but is an apparently gentle, continuous slope from the base of the mountain down to the river edge.

This lower valley is really very beautiful, with grand mountains on the east, fertile farms, and abundant water supply. Seen from a limestone knob standing up from the plain near the mouth of Deep creek, the valley to the south is a flat, alluvial plain, a few groves of cottonwoods marking the river's meandering course, and lines of trees showing where the plain is crossed by tributary streams from the mountains. The valley bottom slopes up from the river on the east side almost imperceptibly, till 1,000 to 1,200 feet above the Yellowstone, the slope really being formed by adjacent alluvial cones. At the foot of the mountains a heavy growth of pine timber darkens the slopes, extending up the mountain sides as far as the trees can obtain foothold, and dotting the rugged buttresses and crags of the lower part of this "Rough-enough" range.

The alluvial cones or foothill slopes show no benches nor definite morainal ridges save that already noted at Pine creek. They are without doubt largely formed of morainal gravels washed down when small local glaciers occupied the mountain gorges. Between Pine and Deep creeks these alluvial trains with definite morainal ridges reach far up into the mouths of the canyons. Where Deep creek debouches from the mountains the slopes show several well defined benches formed of great granite boulders; but the benches do not extend more than one-sixth of a mile beyond the canyon, running out in the uppermost part of a perfect alluvial cone.

The high mountains east of the lower valley are deeply trenched by narrow canyons that are almost free from glacial detritus. This is easily explained by the torrential character of the drainages which carried the debris down and banked it up at the mouths of the canyons in the high boulder benches just noted. These fade rapidly into the heads of steeply sloping broad cones of alluvial gravels and long wash slopes.

On the west side of the river the valley bottom is well terraced and bounded by gentle hills in which there are no large streams. These slopes are generally bare and grassy, occasional pines emphasizing a rocky outcrop or defining the basin at the head of some small dry drainage way.

Below the valley the river flows between steep rocky walls of upturned sedimentary rock, showing a most beautiful section of the Paleozoic beds. The river is cutting down its bed slowly at present, and flows in a number of interosculating channels, separated by numerous islands green with grain or covered by groves of stately cottonwoods.

Discussion of evidence.—It is apparent from an inspection of the accompanying map, upon which the outline of the drift has been indicated, that the glacier which occupied the valley bottom, great as it was, and coming from that great center of dispersion, the Yellowstone park, was a very local ice stream. Yet its influence upon the topography, and, to some extent, the scenery of the area covered by it, warrants this extended account of its work.

In the upper mountain valley the glacial detritus is very small in amount, in fact only insignificant deposits have been left in certain sheltered positions, though the retreating ice dropped boulders pretty generally over the entire area covered. The work of the ice in this part of the field was mainly that of erosion. The amount of this erosion it is impossible to tell. Upon the granites and gneisses the ice has left an unmistakable record of its power to plane and polish, but the volcanic breccias show only the broader features of the erosion performed by ice, the rock not being suitable for the preservation of the finer features of such work, but probably yielding somewhat readily to the plucking action of the ice.

In the lower valley we have direct evidence of an advance of the trunk glacier as far north as Fridley, in the glacially planed surfaces of the basalt sheets found in the center of the valley. It is supposed that horizontal rock layers, such as these, do not present the most favorable conditions for glacial erosion and striation, yet these surfaces afford well preserved evidences of both in their low, rounded, and polished domes of rock, and their north and south striæ, which must have been formed by a somewhat thick sheet of ice moving northward. In support of this we have the presence of basalt boulders, undoubtedly from this valley sheet, in great abundance, north of the eastern table. These boulders are generally well glaciated, for the rock being very hard and resisting weathering well, preserves such traces in an excellent condition.

As these boulders occur for several miles northward from the basalt table, and at elevations almost equal to that from which they come, it is evident they have been plucked and carried forward beneath the ice, and they form further and confirmatory evidence that the ice stream,

thinned as it must have been at this point, was still capable of doing a considerable work. It is evident that these basalt boulders, like those torn and transported from Cinnabar mountain, originated and were transported wholly beneath the ice, and were not frost-riven fragments from peaks and arêtes projecting above the ice. They thus afford a demonstration of the efficiency of the ice stream as an erosive agent. It should be remembered in this connection that the fall of the valley is only some 200 feet from the mouth of Yankee Jim canyon to the extreme border of the drift, some 18 miles, and that the glacier, crowded between the mountain slopes and in the gorge of Yankee Jim canyon, expanded out to at least twice that width in this broad valley.

The quartzite drift and limestone boulders found on the basalt tables, may evidence a pushing westward of the tributary glacier of Emigrant creek, following a recession of the valley glacier. At any rate the absence of these forms of drift south of this part of the valley is certainly significant. It is to such an advance that we must ascribe the morainal heaping on the eastern basalt table, though the ridges and accompanying intervening channel-like vales may conform indirection to the movement of the ice stream, as has been in the case in the ridge moraine of the Boulder glacier. It is believed that the great benches or terraces of Big creek, Rock creek and Tom Minor creek are not of glacial origin, and that the coincidence of the drift limit with their borders possesses no especial significance. The narrow bench lines striating the slopes about the mouths of Stricklin and Dry creeks, are in part at least (see Fig. 1) the work of streams marginal to the ice.

THE BOULDER GLACIERS.

General description.—The mountainous area immediately north of the Yellowstone Park and bounded by the Yellowstone river on the west and north is an alpine region abounding in grandly beautiful scenery. It is characterized by a great plateau of Archean gneisses, deeply trenched by the many streams which have their sources in the snow banks and lakes of their summits, and by high peaks of volcanic rocks whose peculiar erosion adds pleasing variety to the types of mountain scenery afforded by the limestones to the north and the Archean masses on which they rest.

This block of mountains was very generally covered by ice during the period of glaciation, which sent ice streams down the principal gorges and mountain valleys. Both the plateau summits and these mountain canyons present undoubted evidences of the work of the ice in producing the present configuration of the surface.

To the northward there are two ice streams occupying the principal valleys, those of the Boulder and its tributary, the West Boulder. The path of these glaciers and the mountain area in which they originated present us with very interesting and typical examples of alpine glaciation.

The principal stream draining this alpine area is the Boulder river. Heading in the many lakelets which lie nestled in the mountain basins about Haystack peak, the stream flows rapidly through a narrow gorge which it has cut through the granites in past glacial times to the point where its volume is augmented by a considerable stream called Bridge creek. From here northward it flows in a boulder-choked channel through the great canyon of the Boulder, whose glistening walls of polished gneiss rise 3,000 feet high on either side. For the last few miles of its course through this impressive gorge the stream meanders somewhat slowly through a network of channels bordered by dense growths of spruce and fir, with thickets of brushwood; then quietly glides through boggy meadows past the cottonwood-covered islands at the gate of the mountains. Immediately above the Natural Bridge the stream flows in a limestone bed, in which it soon cuts a rapidly deepening gorge as it flows northward in a series of rapids and cascades to disappear in a snowy white feathery fall of 25 feet into the tunnel of which the Natural Bridge forms the portal. Emerging a hundred yards to the north and 100 feet below, the stream falls into a tranquil pool at the head of a gorge that is a mile or so long and has limestone walls 100 feet high. The roof of the first short tunnel is a dry river bed, the floor of a gorge that is a continuation of the picturesque cutting above the Natural Bridge. The numerous potholes and water-worn ledges show that the river must flow over this channel in time of flood, to fall over a vertical wall into the pool 100 feet below. The beautiful canyon cut in a low limestone anticlinal north of this is, however, immediately deserted by the river, which at once enters a tunnel in the western wall, only to emerge at the northern end of the canyon. That this gorge is occasionally occupied by the river is attested by the driftwood and gravel in its bottom; but the great slopes of talus, where firs 60 feet high are growing, show that such occupancy is but temporary.

The valley of the Boulder begins at the north end of this deserted river canyon, and is cut in the Cretaceous sandstones and shales, resting upon the steeply upturned Paleozoic limestones which flank the Archean gneisses, and whose upturned ledges form the end of the canyon. This valley is about three-fourths of a mile wide, and flanked by walls of Cretaceous rocks, a few hundred feet high on either side. In this upper valley the river peacefully meanders in graceful curves and ox-bow loops, through broad alluvial flats covered by cottonwoods, until it is joined by the West Boulder. Here as it leaves the morainal drift the valley immediately broadens out to a nearly uniform width of a mile, and the bottom lands and terrace flats are of greater extent and generally occupied as farms. In this part of its course the river flows more rapidly, dashing against the many great boulders which fill its channel, or cutting the bluffs of volcanic breccia out of which the valley has been carved farther northward.

This lower valley is extremely beautiful and picturesque; its softer contours and bright green slopes being in pleasing contrast to the wilder and grander scenery of the upper part of the river's course. The walls to the west are often picturesquely pinnacled and buttressed by the erosion of the breccia, while on the east of the stream are broad and charming alluvial terraces. A broad and distinctly cut bench scores the slopes of the east, and runs into a broad gravel covered terrace, which at the mouth of Cherry creek is 250 feet above the river. It forms the beginning of the terrace system of the Yellowstone through which the Boulder has cut its way to join that stream in the valley about Big Timber. In this lower part of its course the stream is bordered by a great terrace formed of flats of bowlders and gravel, brought down by the stream from the morainal drift of its upper course.

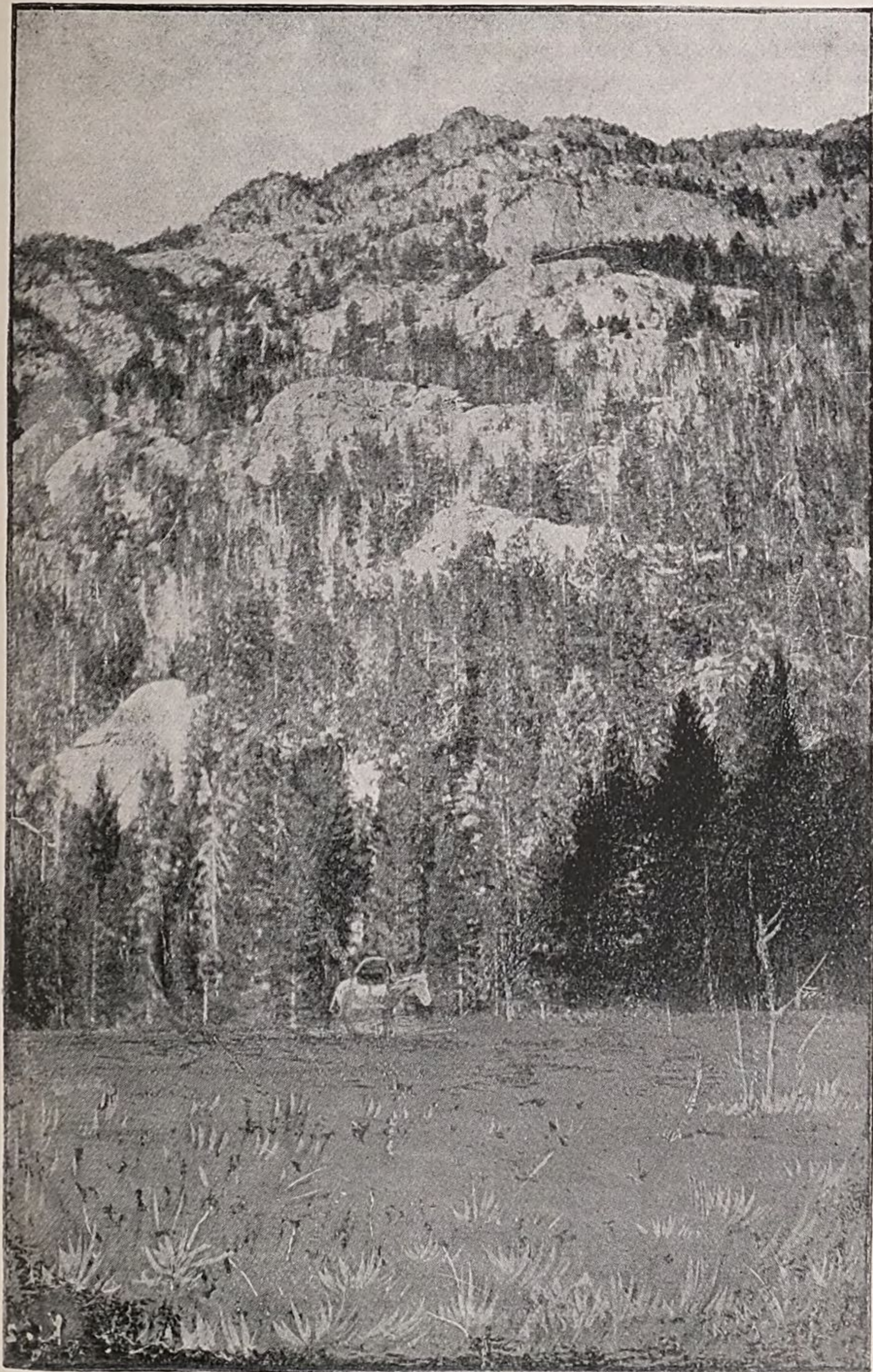
Like most mountain streams the river has a descent so great that it has removed and carried down the greater part of the morainal débris which choked its course, a work that is still in progress.

Névé fields.—It is impossible to define the névé fields of this region because the summits of the high plateau, over 10,000 feet above the sea, show glaciated surfaces which can not be differentiated from those found at lower elevations where there is undoubted evidence of true glacial movement in the general topographic relations, and where the summits and mountain basins show morainal accumulations in sheltered nooks that have undoubtedly been left by the shrunk remnants of the greater glaciers. These summits are characterized by an abundance of lakelets occupying rock basins, or occasionally held by dams of morainal material.

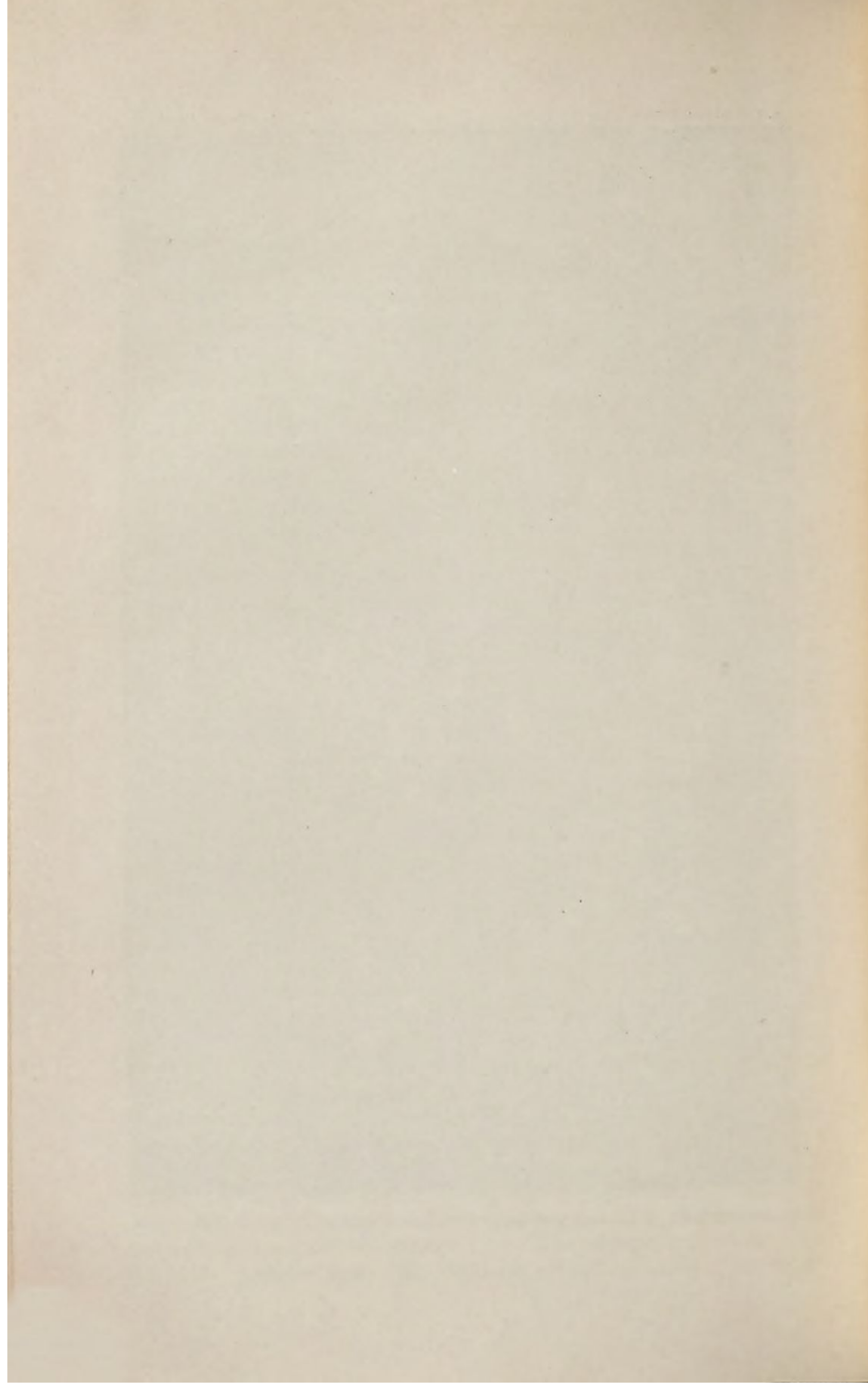
The gorges which head in these basins and amphitheaters, are typically glacial in form and show good examples of ice scoring when they are cut in the gneisses. Upon the divides and ridges at the heads of the gorges, bowlders are frequently found as instanced at the head of Sixmile creek, where a gneiss erratic, a foot in diameter, rested upon volcanic breccia, at 9,400 feet in a position which it could only have reached by transportation across an intervening valley several hundred feet deep. It is significant as evidencing a general movement northward of the ice sheet covering the central portion of the range as well as the more common movements down the mountain gorges.

The observations of Mr. Iddings, by whom the general geology of this mountain tract was studied, showed that glaciated surfaces prevail about the heads of all the more important drainages the slopes being characterized by glacial striæ, running away from the divide and down the valleys.

My own observations show similar glaciated areas at the head of the Boulder about Haystack peak. Haystack basin, a mountain-top terrace, shows beautifully glaciated surfaces of diorite with local drift deposits and occasional erratics from the neighboring peaks. Two glaciated lakelets make this basin an attractive camp. The slopes



GLACIATED WALL OF BOULDER CANYON, SHOWING OCCUPANCY OF ENTIRE CANYON BY ICE.



of Haystack, crossed by the trail from the gold mines, show good examples of glaciated ledges roughened by plucking.

Canyons.—From the Haystack mines northward to Bridge creek, the canyon is decidedly rugged, with a terraced bottom such as is common in the glaciated canyons of the Sierra Nevada. The adjacent slopes are rugged, and though showing well glaciated surfaces lack the general rounding so prominent in the canyon farther northward, and are definitely though irregularly benched. These surfaces are barer than those to the north, and apparently more freshly glaciated. The slopes have been bared by avalanches, whose paths are plainly marked by areas of devastation, in desolate contrast to the flower-covered opens or the picturesque pine groves of the neighboring slopes. The stream flows through a channel, very narrow, steep and rocky; there are no alluvial flats, though well-wooded benches covered with talus extend along the canyon bottom.

The first and in fact the largest open or park of the canyon, called Hicks park, is situated about ten miles below the mines. The stream leaves its rocky bed a few miles below this and flows thereafter over a bed of boulders and morainal debris filling the valley bottom. In fact the quantity of debris left by the retreating glacier is so great that the stream, notwithstanding its steep descent, has been unable as yet to clear it out. Below Hicks park the canyon walls are much nearer together than farther north and show beautifully glaciated moutonnéed surfaces. (See Plate IV.) Considerable morainal accumulations fill the canyon bottom at the mouth of a large stream from the west, the open hills being known as Lick park. Two lakelets fill hollows in an old river channel in this moraine, and sharp ridges of debris fill the bottom. Below this point the canyon walls recede, and the glacial U shape is very prominent.

This canyon of the Boulder is extremely disappointing to the traveler. The walls below Lick park, though rising to great altitudes, 3,000 feet and more above the stream, are receding, generally wooded, and do not fulfill the promise of rugged beauty given by the entrance to this great gorge. This is no doubt largely due to the general roundness caused by glacial erosion. The bosses of rock in the canyon bottom and the upper walls alike show glacial rounding and polishing shown in Plate IV, and the resulting smoothness is a disappointment so far as scenic beauty is concerned. The limestone slopes at the mouth of the canyon and about the Natural Bridge show the result of the glacial erosion of sedimentary rocks. From here northward the ice has filled the valley trough and overflowed the walls covering the adjacent slopes. Its margin is easily defined by the rather heavy deposits of drift and débris, but it is evident that there was little, if any, erosion of these surfaces, for the ledges of limestone show no abraded surfaces, nor does the drift farther north contain fragments of these rocks. This failure to erode the sedimentary rocks is the more

remarkable since the ledges dip at an angle of some 30° in the direction of the movement and the alterations of shale and sandstones have brought the ledges of harder rock into bold relief as hogback ridges.

Moraines.—In this lower part of its course the river has removed most of the morainal débris from the valley bottom, and it is only upon the surfaces above the valley wall that the glacial débris forms noticeable morainal heapings. These extend northward to the mouth of the west fork of the river.

Notable morainal heapings occur on the East Boulder in its upper mountain valley, but present no claims to novelty. A high monoclinal wall prevented their extension northward into a basin filled by glacial gravel sands, an attractive area, upon which the white settlers look covetously. It is a broad, open basin, the center being a nearly level gravel terrace through which the streams heading in the mountains to the east have cut down some 100 feet without reaching bed rock. To the south the slopes are not glacial, the limit of the drift being about the edge of this alluvial basin. From here to the mouth of the east fork the drift covers the lower slopes east of the stream, but does not surmount to rocky ledges of Cretaceous sandstone outcropping above. The area between the East fork and the Boulder is a low triangular doab heavily covered by drift. A scar made by the river shows in one place a thickness of 50 feet of stratified sand and gravel, overlaid by drift, but erratics are rare.

The glacier that occupied the valley of the West Boulder did not extend as far northward as that of the main stream, and ends just north of the point where the McLeod wagon road crosses the stream.

The ice stream which filled the valley of the West Boulder overflowed the walls of this valley, and left its morainal debris to mark its limits on the adjacent slopes. This drift forms a narrow belt, in general parallel to the stream, resting upon the eroded surfaces of the upturned and flexed beds of the upper Cretaceous. Where it is crossed by the McLeod road near its northern termination, it shows the usual knob and sink topography of these moraines, the hillocks of the large drift, the sinks, often the beds of dried ponds. The boulders average 3 to 5 feet in diameter. This part of the moraine shows water channels, a feature that is absent from the moraine on top of the bluffs upstream. On the east side of the river the moraine terminates in a considerable accumulation of debris forming a tumultuous assemblage of hummocky knobs and sinks, the material being quite coarse and but little rounded, and manifestly largely from the surface of the ice. The summit of this moraine is formed of some ten parallel boulder ridges, with grassy, boulderless troughs between, some 25 to 30 feet wide.

The moraine upon the west side of the river presents few points of interest. Back of the "Blue Rim" cliffs it forms a considerable lakelet by damming the natural slopes, and its margin is very sharply defined upon the Laramie sandstones. As a rule the surface of this

moraine is very rough, the drift varying greatly in size, and including many large blocks principally of granite, gneiss, and schist. Near the mouth of Davis creek the drift contains abundant boulders of limestone and of conglomerate, but these rocks do not extend more than a mile north of their outcrops. Immediately back of the "Blue Rim" cliffs there is a moraine flat 200 yards wide at the top of the bluff, and back of this the usual hummocks prevail.

The country east of the river is very generally heavily mantled by morainal debris for some distance back from the edge of the bluffs. The table-land south of the McLeod road shows a fine alluvial area that is very fertile, owing to the damming back of the drainage by the moraine. The moraine itself is here very rough, and dotted with eight lakelets. Further south this character is preserved to the mouth of the mountain canyon, corresponding to the outcrops of the Carboniferous rocks. At the mouth of this grandly picturesque mountain gorge the canyon bottom is choked with drift and the stream is yet cutting down through the drift, and has at some late date formed a lake immediately above the mouth of Davis creek, whose grassy flats form a fine hay ranch.

Terraces.—Although it will be seen from this account of the morainal accumulations of the Boulder, and its branches that the amount of debris is considerable, yet it is small compared with the erosion which the ice has accomplished. In fact, the accumulations of the West Boulder, though not extending so far northward, are greater than those of the main stream. The question at once arises what has become of the eroded material?

Although these glaciers had a length of 10 to 20 miles, there are no great morainal embankments to show their former magnitude, such as abound in the Wind River mountains and the Hoback ranges south of the park. The reason is perhaps to be found in the great terraces of gravel that border the Yellowstone. The lower course of the Boulder river is marked by terraces of assorted drift, but the narrowness of the valley has not favored the preservation of the great trains of debris which undoubtedly were carried down the valley from the termination of the glacier. The larger part of this material was probably swept northward by the flooded stream, and helped to build the broad and extensive terraces of the Yellowstone. It should be noted, however, that there is a considerable terrace on the east side of the Boulder, corresponding in level to the great upper terrace of the Yellowstone, south of Big Timber. It is a very level area about a mile across, in greatest extent, sloping to the north downstream, covered by well rounded cobbles and gravel of gneiss, limestone, shale, conglomerate, and other rocks found to the south. This terrace is, however, but part of the great system that forms so prominent a feature of the piedmont country of this region and record an elevation and erosion, subsequent to the maximum of glaciation.

The Boulder glacier was the usual type of mountain ice stream, common in the Rocky Mountain region south of the limit of the great Cordillera glacier described by Dawson. It differs but slightly from those that streamed outward from the deep-cut gorges of the Crazy mountains, where the source of supply was small and local.

Further studies are in progress in other parts of the Cordillera, from the Canadian line southward, and also of the isolated groups of mountains, the Crazies, Highwood, and others that form such striking features of the plains country east of the main ranges. It is believed that the results will contribute much of value to the history of the Pleistocene in this region and throw light upon some of the little understood problems that confront the geologist.

INDEX.

	Page		Page.
Alluvial terraces and cones	31-33	Glacial flood plain	31
Bear gulch, glaciation in	15-16	Glacial stream channels	23-24
Big creek, glacial terraces on	26	Glacial striæ	23
Boulder river glaciers	34-40	Glaciation, limits of	15
Boulders transported to higher levels	18	Hague, Arnold, cited	13
Canyons in the foothills of glacial origin	27-31	Iddings, J. P., acknowledgment to	20
Chicory, terraces near	32	Lakes, morainal	21-22
Cinnabar basin, glaciation in	17-18	Moraines	20, 21-22, 31, 32, 38-39
Cinnabar creek, glaciation on	17	Névé fields	15, 36
Cinnabar mountain, glaciation on	16-17	Pine creek, glaciation on	32
Cinnabar valley, glaciation in	15-18	Rock creek, glacial terraces on	25
Cones, alluvial	32	Sepulcher mountain, glaciation on	16
Deep creek, glaciation on	32	Sheep mountain, glaciation on	15
Drift in Emigrant valley	23, 24-27	Sixmile creek, glaciation on	21-22
Dry creek, glacial terraces on	25, 26	Striæ, glacial	23
Duck lake	21	Stricklin creek, glacial terraces on	25, 26
Eightmile creek, glaciation on	28, 31	Sphinx mountain, glaciation on	17, 18
Emigrant valley, glaciation in	19-34	Terraces and benches	25-27, 31-32
Fridley, river terraces near	31-32	Yankee Jim canyon, glacial action in	18-19, 20
Glacial canyons in the foothills	27-31	Yellowstone glacier described	14

1	.....	1	.....
2	.....	2	.....
3	.....	3	.....
4	.....	4	.....
5	.....	5	.....
6	.....	6	.....
7	.....	7	.....
8	.....	8	.....
9	.....	9	.....
10	.....	10	.....
11	.....	11	.....
12	.....	12	.....
13	.....	13	.....
14	.....	14	.....
15	.....	15	.....
16	.....	16	.....
17	.....	17	.....
18	.....	18	.....
19	.....	19	.....
20	.....	20	.....
21	.....	21	.....
22	.....	22	.....
23	.....	23	.....
24	.....	24	.....
25	.....	25	.....
26	.....	26	.....
27	.....	27	.....
28	.....	28	.....
29	.....	29	.....
30	.....	30	.....
31	.....	31	.....
32	.....	32	.....
33	.....	33	.....
34	.....	34	.....
35	.....	35	.....
36		36	
37		37	
38		38	
39		39	
40		40	
41		41	
42		42	
43		43	
44		44	
45		45	
46		46	
47		47	
48		48	
49		49	
50		50	

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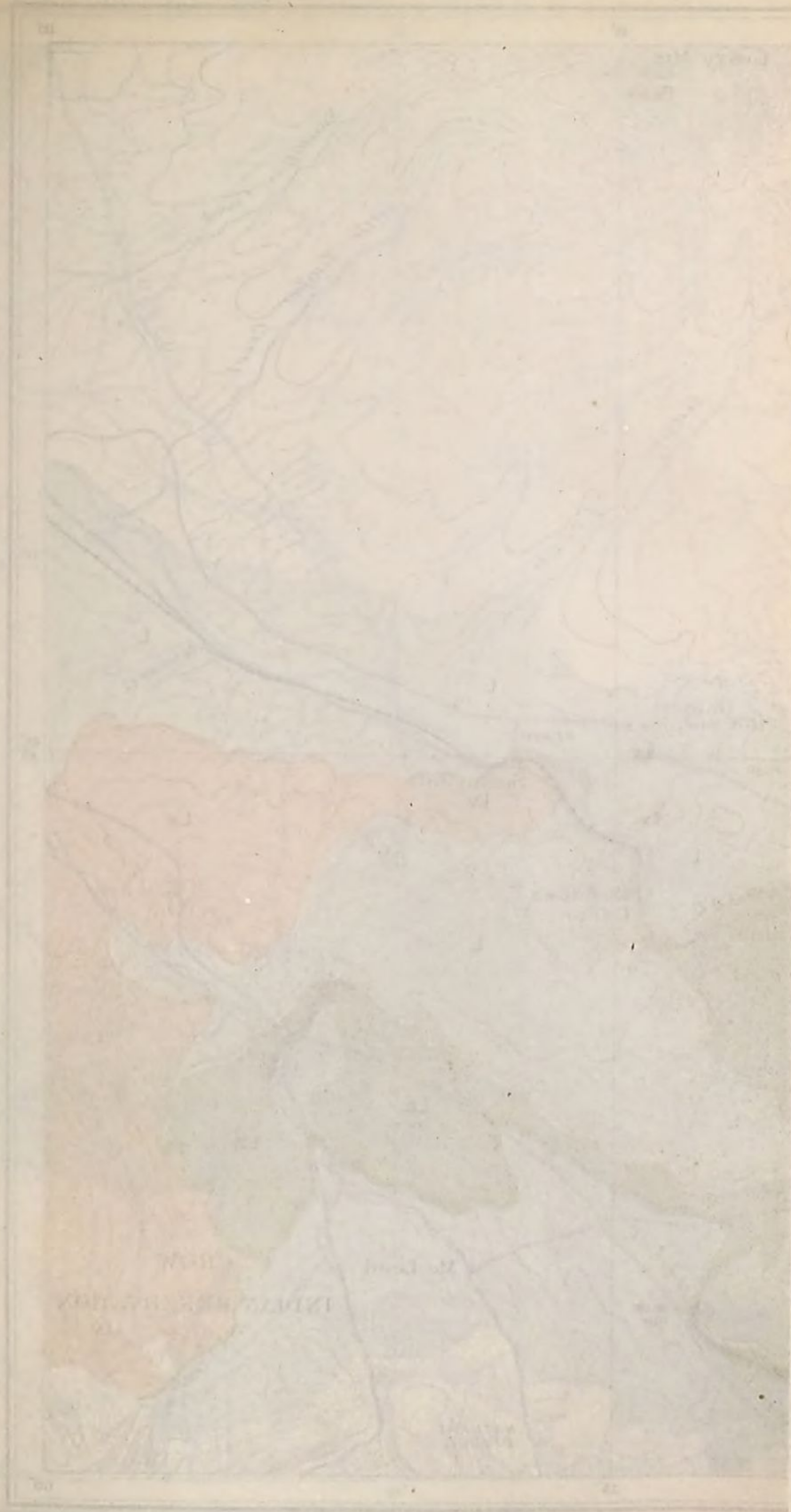
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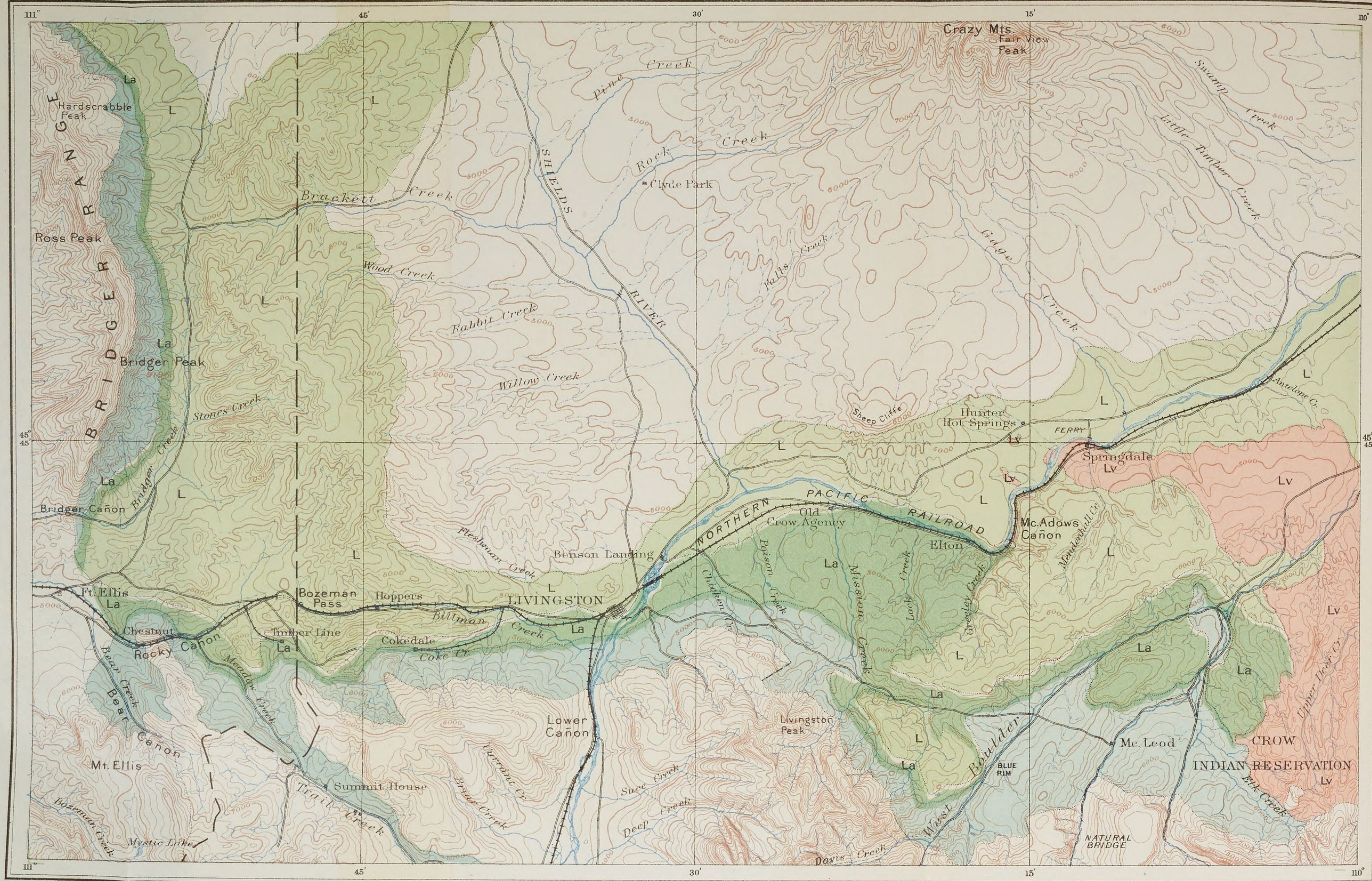
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WASHINGTON, D. C., *June, 1893.*





Distribution of
CRETACEOUS FORMATIONS NEAR LIVINGSTON, MONTANA.

L. Livingston

Lv. Livingston Agglomerates

La. Laramie

Montana Colorado

SCALE. 1 2 3 4 Miles.
CANTON INTERVALS 200 FT.

DEPARTMENT OF THE INTERIOR

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 105



WASHINGTON
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1893

DEPARTMENT OF THE INTERIOR

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1901

UNITED STATES GEOLOGICAL SURVEY

J. W. POWELL, DIRECTOR

THE LARAMIE

AND

THE OVERLYING LIVINGSTON FORMATION IN MONTANA

BY

WALTER HARVEY WEED

WITH

REPORT ON FLORA

BY

FRANK HALL KNOWLTON



WASHINGTON

GOVERNMENT PRINTING OFFICE

1893

UNITED STATES GOVERNMENT

DEPARTMENT OF AGRICULTURE

THE FLORA

OF

THE DISTRICT OF COLUMBIA

BY

JOHN R. CLARK

WITH

REPORT ON FLORA

OF

THE DISTRICT OF COLUMBIA



WASHINGTON

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CONTENTS.

	Page.
Letter of transmittal.....	9
Outline of paper.....	10
Introduction	11
Geography of the region	12
General geology	13
The Mesozoic section.....	15
Jura.....	16
Cretaceous.....	17
The Laramie formation	18
The Livingston formation.....	21
Distribution.....	21
The Leafbeds.....	22
Blue Rim section.....	23
Distribution and character.....	24
The volcanic agglomerates	26
Distribution.....	27
Relation to Leafbeds	29
Livingstone conglomerates.....	30
Materials composing the Livingston.....	32
Fossil remains of the Livingston	33
Fossil Fauna	33
Fossil Flora	34
Unconformity between Laramie and Livingston formations.....	34
Fort Union formation.....	35
Age of the Livingston formation	36
Canadian nomenclature	37
Post-Laramie volcanic eruptions.....	38
Summary	40
 FOSSIL PLANTS OF THE BOZEMAN COAL FIELD, by F. H. Knowlton	 43
Annotated list of species.....	43
Table of distribution.....	45

COVET

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
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66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

ILLUSTRATIONS.

	Page.
Plate I. Map showing distribution of the Laramie and Livingston beds in the country adjacent to Livingston, Mont	Frontispiece
II. Tilted agglomerate beds near Springdale	28
III. Conglomerate beds forming anticlinal ridge between Brackett and Flathead creeks	30
IV. Conglomerate beds showing size and rounding of pebbles	32
V. Fossil plants from the Laramie and overlying Livingston formation of Montana	64
VI. Fossil plants from the Laramie and overlying Livingston formation of Montana	66
Fig. 1. Diagrammatic section showing exposures near Hunters Hot Springs.	29

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
YELLOWSTONE NATIONAL PARK DIVISION.
Washington, D. C., July 18, 1892.

SIR: I take pleasure in transmitting, herewith, a paper by Mr. Walter H. Weed, entitled "The Laramie and the overlying Livingston Formation in Montana," with a report upon their Flora, by Mr. Frank H. Knowlton.

In working out the geology of the Cordillera there are no more important chapters than those that relate to the physical history of the Laramie and the overlying formation. These rocks are well developed in the Yellowstone valley, between the Bridger, Snowy, and Crazy mountains, and Mr. Weed has devoted much time to their study, embodying the results of his investigations in the present paper. He presents most forcible reasons for dividing the great thickness of beds which have heretofore been included in the Laramie into two distinct horizons, restricting the use of the term "Laramie" to the sandstones conformable to the underlying marine Cretaceous, and designating the overlying unconformable beds as "the Livingston formation." The physical conditions shown in the Yellowstone valley are strikingly in accord with those described by Mr. Cross along the Front range in Colorado. It is by such detailed studies that we shall finally arrive at the true geological limits of the Laramie formation.

In the accompanying paper Mr. Knowlton admirably supplements the work of Mr. Weed. He discusses the fossil flora from both horizons in the Yellowstone valley, reviewing all the material obtained since 1871. The two papers taken together form an important contribution to our knowledge of these beds.

I take pleasure in recommending its publication as a Bulletin of the U. S. Geological Survey.

Yours, very respectfully,

ARNOLD HAGUE,
Geologist in Charge.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

OUTLINE OF PAPER.

Briefly summarized, this paper gives an account of a series of beds heretofore embraced within the Laramie, and covering the greater part of the state of Montana east of the Rocky mountains. It is shown that the thickness of some 13,000 feet of sandstone shales and conglomerates belong to three formations: the Laramie, the overlying Livingston, and the higher Fort Union beds. The Laramie is briefly described, and an account given of the overlying series of strata composed of water-laid and assorted volcanic material, which are named the Livingston beds. Observations prove that these beds overlie the coal-bearing true Laramie rocks, and that they contain intercalated beds of true volcanic agglomerate. The entire Livingston formation is overlain by a great thickness of beds of fresh-water sandstones, of which the Crazy mountains are formed, which are believed to be of Fort Union age. Stratigraphical evidence is presented to show that the Livingston beds are of post-Laramie age, yet older than and distinct from the Fort Union Eocene. Evidence is given showing an uplift with erosion during the accumulation of the Livingston beds, and after the formation of the Laramie coal beds, and it is shown from the composition of the conglomerates and their relation to the consolidated ejectamenta of explosive volcanic eruptions and from the nature of the overlying beds forming the Crazy mountains, that we have undoubted proof of powerful dynamic movements, accompanied by an eruptive activity following soon after the epoch of the coal-bearing Laramie, and marking the inception of that long period of volcanic action which continued with various interruptions into Pleistocene times, and formed the great volcanic area of the Yellowstone National park.

THE LARAMIE AND THE OVERLYING LIVINGSTON FORMATION OF MONTANA.

By WALTER HARVEY WEED.

INTRODUCTION.

The region of the Great Plains which forms the eastern portion of Montana and the Cordilleran region of the western part of the state, present widely different types of scenery and geological structure. The first is but a continuation of the broad trans-Mississippian plains stretching northward along the eastern front of the Rocky mountains far into Canadian territory. The latter is a complex of mountain ranges, where the folding and faulting of the rocks is both intricate and obscure. It is with a portion of the border line between these two sharply contrasted regions that the present paper deals, a region where the slightly folded rocks of the plains are warped and crumpled upon the flanks of the mountains that form the easternmost portion of the Cordilleran area.

In the foothill country, lying at the base of the mountains south of the Yellowstone river, near Livingston, Montana, a series of water-laid strata, composed mainly of volcanic detritus and overlying the coal-bearing Laramie beds, was observed by the writer in 1890, while studying the geology of the region, in continuation of the work of the Yellowstone park survey. Further exploration proved that the series covers a large part of this region and is separable lithologically and by evidences of unconformity into a distinct formation.

Measured sections of the strata about the Crazy mountains show a thickness of 12,000 feet of fresh water sandstones and clays referred to the Laramie. It is now possible to subdivide this great thickness of beds into Laramie, a higher horizon herein named the Livingston, and the still higher beds of the Crazy mountains, which have not as yet been differentiated into horizons, but probably represent the Fort Union beds of eastern Montana.

These beds present proof of a series of events following the epoch of the coal-making Laramie similar to those described by Whitman Cross,¹

¹The Denver Tertiary Formation. Amer. Journ. Sci., vol. XXXVII, April, 1889.
Post-Laramie Deposits of Colorado. Am. Jour. Sci., XLIV, July, 1892.

in Colorado, of which the Arapahoe and the Denver beds are the evidence. The importance of this post-Laramie elevation and erosion with accompanying volcanic activity has been strongly insisted upon by Mr. Emmons,¹ and is confirmed by rapidly accumulating evidence observed in different parts of Colorado.²

The strata described in the present paper, though differing in many points from those of Colorado, attest a somewhat similar period, and afford the first recognition of the epoch outside of Colorado.

In this part of Montana the orographic movements that produced the Rocky mountain ranges were accompanied by periods of volcanic activity prolonged into late Tertiary time, which resulted in the accumulation of vast quantities of agglomerates, breccia, and lava flows, out of which great mountain ranges have been carved. These volcanic accumulations have been studied for many years in the region of the Yellowstone park and the adjacent country, where they rest upon Archean gneisses, eroded Paleozoic limestones, and Cretaceous sandstone alike, but no definite age could be assigned to the beginning of this long period of disturbance and volcanic activity.

Examinations of the Laramie and post-Laramie strata east of Livingston showed that these beds were several thousand feet thick, and included an intercalation of volcanic agglomerate that represents, in part, the source of the sands and pebbles of the stratified rocks. As the water-laid beds of the series contain determinable plant remains and a scanty fresh-water fauna, they possess decided interest in the light they throw upon the age at which the remarkable series of volcanic eruptions of this region began.

GEOGRAPHY OF THE REGION.

The region in which these formations have thus far been mapped and studied embraces a part of the Rocky mountains and the country eastward. Geographically the region is an interesting one, embracing the headwaters of the Missouri river, and its great tributary, the Yellowstone. The country north of the Yellowstone National park, with that about the headwaters of the Missouri, is a mountainous tract, through which the Yellowstone and the three rivers that uniting form the Missouri, have cut valleys that divide this elevated area into north and south ranges, known as the Snowy mountains and the Gallatin, Madison, and Jefferson ranges. These mountains end abruptly northward in the Yellowstone and in the Three Forks valleys, but the front range of the Rocky mountains is continued north of the Gallatin range by the lesser uplift of the Bridger, which with the lower elevations of Sixteen-mile creek connect the southerly ranges with the Big Belt and Little Belt mountains. The Snowy mountains, which inclose the park

¹ Bull. Geol. Soc. Amer., vol. I, 1890, pp. 245-280.

² R. C. Hills, Proc. Col. Sci. Soc., 1890.

upon the north, are encircled by the Yellowstone river, whose broad valley about Livingston is typical of its further course.

North of the Yellowstone river are the Crazy mountains, a strikingly picturesque and rugged group of peaks. They form an isolated mountain mass standing out prominently by themselves, and separated by wide valleys from the front ranges of the Rockies that encircle them on three sides. In the Crazy mountains and the valleys between them and flanks of the adjacent ranges the formations herein described attain their most interesting development. The southernmost part of this region has been called the Bozeman coal field, as it is an area distinguished by the occurrence of the productive Coal-measures of the Laramie lying east of the city of Bozeman. The "field" is adjacent to the Northern Pacific railroad and is situated 50 miles north of the Montana boundary line, embracing the entire foothill country between the Yellowstone river and the mountains to the south, from Big Timber to Livingston, as well as the rugged country westward, forming the Missouri-Yellowstone divide and the foot slopes of the Bridger range. The mountains bounding the field upon the south are steep and rugged peaks belonging to the Snowy range, through which the larger streams have cut deep canyons on their way to the lower country of the plains. The largest of these streams is the Yellowstone river, which, after leaving the Yellowstone park, flows through a couple of picturesque mountain valleys and intervening canyons and emerges from the mountain region at Livingston. West of this point the railroad follows up a small stream to the Muir tunnel, which gives access to the Missouri drainage, the coal-bearing strata forming a belt south of the railroad as far as Rocky canyon, where they turn northward and are continued along the base of the Bridger mountains and the low uplifts that connect this range with the Little Belt mountains.

GENERAL GEOLOGY.

The structural features of the region present several peculiarities of interest. The mountains lying between the National Park and the Yellowstone river, known as the Snowy range, consist in the main of Archean rocks and volcanic accumulations. The northern peaks of the range show Paleozoic rocks dipping steeply to the northward away from the Archean plateaus. The canyons cut by the streams that issue from the mountains show an S-shaped fold parallel to the mountain front, and modified by a tendency to en échelon folding. Faulting of this fold has brought up Archean rocks, which form high and sharp peaks entirely surrounded by Paleozoic rocks. West of Livingston the warping takes the form of a succession of short anticlinal folds arranged en échelon, with a northeast trend, their axes dipping more or less steeply in the same direction. These folds end in the overturn forming Mount Ellis and the south end of the Bridger range. Nowhere is the relation between geologic structure and topographic relief more

clearly shown, and the cutting across of the anticlinal folds by the mountain streams clearly reveals the details of their structure.

The Bridger range is a fold involving the Livingston and all earlier rocks, of which the eastern side alone now remains. The low mountains northward show parallel anticlinal folds, running north and south, broken through in the Elk mountains by an extensive intrusion of quartz porphyry. In the extensive synclinal basin thus inclosed upon three sides by the uplifts of these front ranges of the Rocky mountains, the Crazy mountains, form a magnificent monument of erosion. The main mass of these mountains is formed by a synclinal of post-Laramie strata, in which the sedimentary rocks have been baked and metamorphosed about a great core of igneous rock, from which dikes radiate on every side.¹

The geology of the Gallatin, Madison and Jefferson ranges, defined by the three forks of the Missouri, is discussed by Dr. A. C. Peale in the text of the Three Forks Atlas sheet of the U. S. Geological Survey.

A number of carefully measured sections were made at different localities, from a study of which and the review of the fossil remains thus far collected, the different terranes have been discriminated. The following section represents the entire stratigraphic series from Cambrian to post-Laramie as developed in the region under discussion.

¹ Geology of the Crazy mountains, Montana, J. E. Wolff, Bull. Geol. Soc. Amer., vol. 3, pp. 445-452.

Geological series exposed near Livingston, Montana.

7,000		Livingston beds—sandstones, shales, and conglomerates.
4,700	1,000	Laramie coal-bearing sandstones and shales; leaf remains, and invertebrates.
	1,500	Montana—sandy shales and argillaceous shales.
	1,600	Colorado—argillaceous limestones, with bituminous shales at base.
	600	Dakota—sandstones and conglomerates.
460	-----	Jura { Sandstones. Limestones and shales.
1,900	400	Carboniferous { Quartzites, sandstones, and interbedded limestones. Limestones, massive, fossiliferous.
	1,500	
450	250	Devonian { Limestones and shales. Limestones—very massive.
	200	
835	410	Cambrian { Limestones, generally massive, with limestone conglomerate, alternating with shales. Soft shales, with interbedded impure limestones and basal quartzite.
	425	
		Algonkian schists.

The section is well exposed in the canyon of the Yellowstone, 4 miles south of Livingston.

THE MESOZOIC SECTION.

A detailed section of the strata overlying the Jurassic limestones has already been published by the writer, but is republished herewith in greater detail, in order that the nature of the Laramie and its relations to the underlying Mesozoic and overlying Mission creek beds may be

fully understood. It represents the series as exposed near the town of Cokedale, some 10 miles west of Livingston.

This section was measured on the slopes west of the south fork of Cokedale creek, and begins at the point where this stream cuts across the anticline of Canyon mountain and exposes the Jurassic shales and limestones.¹ A section of the strata in this vicinity was made for the Northern Transcontinental Survey, a graphic representation of which is published in the very interesting account of the Bozeman coal field written by Mr. G. H. Eldridge.²

Section at Cokedale, Montana.

LARAMIE.		Chocolate conglomerate, 400' above coal-seam horizon.	
	30	Shaly beds; chocolate-colored.	
	2	Conglomerate—local and passing into sandstone; volcanic.	
	210	Limestone.	
	6	Sandstone, shaly.	
	112	Coal (seam worked at Cokedale).	
	20	Sandstones.	
	575	Sandstone ledge; fissile; crest.	
	75	Sandstone; thick beds alternating with thin seams of shale and coal.	
	150	Bluff sandstones; massive, white, etc.	
MONTANA.		Tombstone sandstones.	
	1149	<i>f</i> shaly beds.....	175
		<i>e</i> sandy shales; dark gray.....	245
		<i>d</i> shales and thin layers of sandstone .	315
		<i>c</i> shaly sandstone	40
		<i>b</i> sandstone shale.....	112
		<i>a</i> shale	262
	25	Sandstone, forming crest ledge of 2'-6' (25' near creek); very prominent; pitted, and outcrops marked by pines.	
	300	Shaly beds, weathering down to brown earth with intercalated sandstones.	<i>e</i> shales 195 <i>d</i> sandstone 3 <i>c</i> shales 50 <i>b</i> sandstone 2 <i>a</i> shales 40
COLORADO.	30	Sandstone; big ledge, but not showing on summit of hill; conglomerate at top.	
	350	Shales; gray; sandy.	
	7	Yellow sandstone, fine-grained and fissile, forming striking topographical feature of this depression.	
	247	Shales marked by sharply cut gully.	
	12	Sandstone ledge; gray, very fissile; massive crop, and not generally a ledge.	
	217	Shales.	
	10	Sandstone; micaceous; fucoid impressions; forms low hogback ridge.	
	455	Shales.	
	60	Quartzite; supposed to be summit of Dakota.	
	40	Sandstones; fissile and slabby.	
DAKOTA.	200	Red or yellow limestone or sandstone, with pebbles.	
	8	Quartzite.	
	10	Lilac limestone, magnesian, becoming pebbly at base; passing above into red clays.	
	25	Dakota conglomerate; forming hogback.	
	105	Shales; dark gray; crumbly and earthy.	
	50	Sandstones; indurated, slabby, cross-bedded; white quartz grains, and rusty cement.	
	60	No exposure.	
	5	Sandstone; fissile and crumbly.	
	70	Red shale.	
	5	Dark-gray shale.	
JURASSIC.	40	Limestones, forming lenses in sandstone grit or conglomerate, both carrying broken fossils.	
	75	Sandstones.	
	200	Myacites beds.	
	75	Quartzite; Carboniferous.	

JURA.

The base of this section is the belt of impure limestone and shale that overlies the heavy bed of quartzite capping the Carboniferous. These Jurassic limestones and shales contain an abundance of fossils, among

¹Bull. Geol. Soc. Amer., vol. II, pp. 349-364.

²Reports, Tenth Census U. S., vol. xv, Mining Industry, p. 739.

which *Gryphea* and *Myacites* are the most plentiful. The rocks are soft shales or impure limestones, readily weathering down so that the beds most frequently form a gulch parallel to the strike, where monoclinal folding prevails. Overlying these beds the strata are sandy, and grade into a coarse crystalline limestone full of fossil fragments and changing rapidly into a very remarkable cross-bedded grit, frequently conglomeratic. This bed has been recognized over large areas of central Montana and is generally a conspicuous ledge outcropping on the slope beneath the Dakota "hogback." The fossils found in it are largely fragmentary, but show *Gryphea*, *Ostrea stringulata*, *Camptonectes pertenuistriatus*, and *Rhynconella myrani* in abundance. Between this bed and the Dakota conglomerate there is a series of shaly beds in which no fossils have been found, alternating with sandy strata possessing no marked characteristics. Both sandstones and shales are seldom exposed, but form the slopes between Jura and Dakota ledges. These beds have in the section been assigned to the Jurassic. They correspond in stratigraphic position and lithological character to the fresh-water Jura of Colorado, are variegated in color, but in the absence of fossils can not be positively assigned to the Jura.

CRETACEOUS.

The Dakota.—The Dakota forms the most persistent and readily recognizable horizon of the Rocky mountain Mesozoic. In this region it is generally a sandstone usually with a characteristic conglomerate at the base, which, with the associated sandstones, resists weathering and in the upturned strata of the foothills stands out very prominently. This conglomerate is overlain by variegated magnesian limestone, carrying pebbles at the base, and of a prevailing lilac or red tint. These beds grade into soft sandstones succeeded by sandy shales, and these by a thin bed of fine-grained dark-gray limestone, full of gasteropod shells. An examination of these fossils by Dr. C. A. White, together with the stratigraphical position of this limestone, shows it to be equivalent to the fossiliferous Dakota beds of Bear river, recently described by Mr. T. W. Stanton. This is overlain by sandy shales with some carbonaceous markings (but no recognizable plant remains), capped by the dense pink and white finely granular sandstone or quartzite that is assumed to be the top of the Dakota. It is a very hard rock, resists erosion well, but breaks into great cubical blocks, whose débris is abundant on the slopes and in the valley drift.

Colorado group.—Overlying the beds referred to the Dakota there is a great thickness of shales, with interbedded sandstones. The lower part of this series consists of rather dark carbonaceous shales, with lighter arenaceous beds and occasionally sandstones. In their sandy nature and the presence of beds of sandstone, the beds show evidence of the proximity of a shore line. Fossils obtained from these beds by

W. M. Davis prove the Colorado age of the strata. The following species were identified by R. P. Whitfield:

Inoceramus umbonatus M.

problematicus M.

sp?

undabundris M.

Ostrea congesta.

Gryphea vesicularis.

Exogyra.

Gyrodes depressa M.

Pholadomya Berthoudi (probably *P. papyraceæ*).

Several other species that appear to have no taxonomic value were also found.

Montana group.—A satisfactory discrimination between the beds of the Colorado and those forming this group can not be made on paleontological grounds, as few fossils have been collected in the beds assigned to the Montana. The lower thousand feet consists of sandy shales, impure limestones, and occasional thin sandstones, the whole becoming more arenaceous towards the top and grading into thinly bedded sandstones. These latter beds sometimes form bluff exposures, but more often weather out in "tombstone ledges." In the eastern part of the field the dark gray sandy shales are directly overlain by a heavy ledge, of yellow, rather dark, and very massive sandstone, which is thought to be the equivalent of the Fox hills. It is immediately overlain by the whiter, cross-bedded, and somewhat softer massive beds of the Laramie Coal-measures. No fossils have been obtained from this supposed Fox hill sandstone, which may prove to belong to the Laramie.

Those irregular and local elevations of the Cretaceous sea bed that occurred in the region east of the mountains in Canada and northern Montana, and resulted in the accumulation of estuarine and lacustrine deposits, known as the Belly river beds, are not indicated in the rocks of this vicinity. The Montana beds indicate a varying subsidence and the proximity of a low land mass with a gradual shallowing of the waters that resulted in the accumulation of the sandstones and coal seams of the Laramie.

THE LARAMIE FORMATION.

The Laramie, the chief coal-bearing formation of the Rocky mountain region, is well developed in Montana. In the particular area under discussion the strata form a continuous belt stretching westward along the flanks of the Snowy mountains, and northward upon the slopes of the Bridger and Little Belt ranges. Isolated exposures also occur in the mountainous region to the west, which though of small geographical extent, present structural features of much interest.

The area in which the Laramie strata are exposed is the region adjacent to Livingston is shown upon the geological map, Plate I.

The rocks of this formation form a group which is sharply defined both by fossils and physical characters. The beds consist of massive light-colored sandstones, with intercalated shale beds and coal seams near the base, becoming less frequent toward the top. The lower delimitation of the Laramie is assumed to be the dark and heavy bed of massive sandstone, assigned to the Fox hills, found below the lowest workable coal seam and resting directly upon the readily distinguishable and lithologically distinct gray shales and fissile argillaceous sandstones of the Montana group. The upper limit of the Laramie in the region studied is marked by an abrupt change in the composition of the beds and closely resembles in general characteristics that change which has been found so prominently developed in Colorado.

This definition of the Laramie is in accord with the original definition of King, and conforms to the usage of Newberry, Emmons, and Cross, though differing from the limits assigned on theoretical grounds by Prof. White, which are based upon faunal characteristics. The occurrence of marine Cretaceous fossils in the Laramie, showing temporary recurrence of salt-water conditions following a considerable period of coal-making depositions is now a well-established fact.

As exposed at various localities throughout this region the average thickness is 1,000 feet. This is exceeded in the hills north of the Bridger mountains, but is about the thickness throughout the Bozeman coal field. The exposures can not be directly compared, however, since there is proof of a considerable period of erosion following the deposition of the beds of the Laramie group, during which the upper portion of the series may have been in part removed, before the deposition of the Livingston. The sandstones which form the characteristic feature of the group and distinguish it from the underlying formations occur in beds of varying thickness, alternating with gray shales carrying plant remains, and seams of coal. The thicker beds of sandstone are generally massive, but the rocks have a laminated structure, following the cross bedding, and erode into picturesque bluff faces. The shales and coal seams, abundant near the base, become less frequent higher in the series, though a workable coal seam is generally found near the top of the series as exposed throughout the Bozeman field. These coal seams form a prominent feature of the series, and though but three or four of the many seams are of workable thickness and purity, have given an economic importance to the formation that has stimulated exploration and added much to our knowledge of the areas covered by this formation.

In general these coals are valuable fuels, differing materially from the lignites of the plains to the east, and are in ready demand throughout the state. They are mined at a number of localities throughout the Bozeman coal field, but elsewhere in this part of the state have not been commercially developed.

The following section is typical of the lower part of the Laramie throughout this region:

Section of Laramie Coal-measures at the Bowers mine.

Number of bed.	Thickness in feet.	
28	30	Massive sandrock, firm, light gray.
27	$\frac{1}{2}$	Coal seam.
26	10	Sandstone, breaking into small angular fragments.
25	1	Shale, dark gray.
24	6	Coal seam.
23	12	Shale, hard and slaty.
22	10	Sandstone, with shelly structure.
21	3	Coal; middle seam.
20	6	Red limestone, very magnesian.
19	3	Sandstone.
18	$\frac{3}{4}$	Coal; called by the miners "upper bastard vein."
17	30	Sandstone, thinly fissile, brown.
16	$\frac{3}{4}$	Coal.
15	10	Sandstone, shaly at top.
14	4	Coal.
13	20	Fissile and leafy sandstone.
12	30	Sandstone, massive, with jointed surfaces rounded.
11	6	Coal; poorly defined; vein 2 or 3 feet; the rest shale.
10	15	Sandstone, massive, brown, much pitted by weathering.
9	2	Coal.
8	3	Sandstone.
7	8	Coal and slate.
6	3	Sandstone, very fissile and soft.
5	10	Sandstone, hard and firm.
4	$1\frac{1}{2}$	Coal.
3	3	Shale.
2	18	Sandrock.
1	2	Coal.

The general characters of the formation are very constant in this particular region—though there is a decreasing amount of coal as the strata are followed northward to the Musselshell river, or into the plains region east of the Crazy mountains.

The lithological characters of these Laramie sandstones present few points of especial interest by themselves, but are of importance when compared with those of the overlying formations. The rocks are rarely compacted, or so firmly cemented as to form quartzites; in thin sections they are seen to be typical sandstones, formed mainly of well-rounded grains of quartz, with mica and accessory minerals, all indicating the erosion of Archean rocks. No fragments or minerals of an eruptive nature are found in any of the sections so far examined. No vertebrate remains have been discovered in the Laramie strata of this particular part of Montana. Leaf remains occur abundantly in the shales overlying many of the coal seams, but the rocks are so crumbly and the specimens so difficult of preservation, that few have been brought in. Leaf remains rarely occur in the sandstones.

The perfect stratigraphic continuity of the marine Cretaceous with the Laramie is apparent everywhere. No break occurs and no evidences of unconformity have been observed, up to the top of the formation. The evidences of such a break and unconformity between this and the overlying Livingston formation are given in the description of those beds.

In the clay shales associated with the productive coal seams, *Unio* remains have been found, the specimens being too poorly preserved for specific determination, and *Corbula subtrigonalis* M. and H. has been identified for me by Dr. White. Fossil plant remains are not uncommon in these shale beds, but the material is too soft to bear transportation, and only a few forms have been brought in. They are discussed at length in Prof. Knowlton's report.

THE LIVINGSTON FORMATION.

Overlying the coal-bearing Laramie strata, there is a series of beds constituting a newly recognized formation, for which the name Livingston is proposed, as it is typically developed in the vicinity of Livingston, Montana. The formation consists of a series of beds, in places aggregating 7,000 feet in thickness, composed of sandstones, grits, conglomerates, and clays, made up very largely of the debris of andesitic lavas, and other volcanic rocks, and including local intercalations of volcanic agglomerates.

DISTRIBUTION.

The accompanying map, Plate I, shows the surface distribution of the Livingston beds in the country about Livingston, the map representing part of the geological atlas sheet bearing that name. The formation attains its greatest development in this region, and in the country immediately north of the area shown by the map—that is, in the region east of the Rocky mountains. But exposures also occur within the mountain region, in the Madison and Jefferson ranges, where they have been mapped and described by Dr. A. C. Peale and indicated upon the Three Forks atlas sheet, and the region drained by Sixteen mile creek, north of the Bridger range, contains a considerable area of these beds. In the Crazy mountains the Livingston is covered by the Fort Union strata, which in this part of the field everywhere overlie and conceal the earlier deposits.

Although the origin of the formation is such that it varies greatly at different localities so that horizons can not be closely defined, there are three general divisions into which the formation may be separated, viz: The leaf beds, the conglomerates, and the volcanic agglomerates. The first two comprise the lower and upper parts of the formation. The third is an intercalation of volcanic ejectamenta that only occurs locally, though attaining a thickness of 2,000 feet in the southeastern

part of the region covered by the Livingston beds. The total thickness of the formation approximates 7,000 feet in the region east of the mountains, where the agglomerates are absent. Of this total thickness from 600 to 2,000 feet may be assigned to the lower division.

THE LEAF BEDS.

The strata grouped together under this name embrace the basal portion of the formation up to a point where a decided change in color, mechanical constitution, and general nature appears, and includes the various horizons in which plant remains have thus far been found. A definite upper limitation is not always possible. On the flanks of the Snowy range the intercalated agglomerates form a convenient point at which to draw the line. Elsewhere it is marked by light colored, thinly bedded sandstones, with green or purple shales, which are readily distinguishable in the field, and are arbitrarily assumed to be the base of the conglomerate series.

This lower division of the Livingston deserves a somewhat detailed description, because it is the only portion yielding paleontological remains, and presents, moreover, features of lithological character and mechanical constitution separating it from the Laramie strata that so generally underlie it. The character of these lower beds, as exposed throughout this region is, therefore, quite fully described. In general it consists of a series of sandstones, conglomerates, and shales composed largely of angular or but slightly water-worn *débris* of volcanic eruptions and ash showers, that rest directly upon the productive Coal-measures. Usually the beds are dark colored and weather into ledges whose appearance suggests a volcanic rock, often breaking down into fine angular *débris*, forming slopes that support a scanty vegetation. Consisting mainly of sandstone, grits, and conglomerates, the beds vary in coarseness at different localities. Contrasted with the Coal-measure sandstones beneath, the rocks are darker, much harder, well indurated, brittle, and break into fine angular bits, while the Coal-measure sandstones are fissile, light colored, and often crumble into sand on weathering. Their intimate composition presents a striking difference in the nature of the two formations, the Laramie sands being well rounded quartz grains derived from Archean land areas, the materials being well assorted and stratified; the Livingston rocks, on the contrary, being composed of angular or slightly water-worn grains, showing no assorting of the material and consisting mainly of andesitic fragments cemented by fine volcanic ash. Plant remains are abundant at various horizons. The thickness of the leaf beds varies greatly at different localities; it is least in the eastern part of the field and increases westward, reaching a thickness of over 2,000 feet in the vicinity of the Muir tunnel and in the range of hills east of the Bridger mountains.

In the foot slopes of the Snowy range these leaf beds are generally green in color and differ somewhat in character from the beds belonging to this horizon in other localities.

THE BLUE RIM SECTION.

A fine exposure of the lower horizon is seen in the canyon walls of the west Boulder river in the extreme eastern part of the region shown in the map (Pl. I). The rocks occupy a shallow synclinal trough capping gray Cretaceous sandstones, and form picturesque cliffs locally known as the Blue rim. A few miles above these cliffs the river emerges from a canyon with walls of gneiss 2,000 feet high, at the northern end of which the section of upturned Paleozoic rocks is well exposed, and the succession of beds from the base of the Cambrian to the rocks of the Blue rim is clearly revealed.

The following detailed section of the beds is introduced to show the variations of the strata:

Blue rim section.

29. Sandstones of varying nature, color, weathering, and fracture, but of substantially the same rock. Occasional pebbles, but not assorted nor arranged. Cross bedding rare. Lense bedding occasional. In general, the arrangement and appearance of the strata is similar to that of the Yellowstone tuff beds of the Fossil Forest. Jasperized wood occurs, but the trees are prostrate.
28. Sandstone, fine grained, and breaking into slabs.
27. 6'. Shale? a dark brown ferruginous belt, that is unusually persistent.
26. 2'. Shaly rock, crumbly, earthy brown, not unlike ordinary Cretaceous shales.
25. 8'. Tuff-sandstone, very fine grained and green colored.
24. 6'. Sandstone or ash bed; forms lowest ledge of cliff.
23. 20'. Sandstone, gray and breaking into small fragments.
22. 3'. Sandstone, massive, weathering like a Laramie ledge.
21. 30'. Shaly bed, fissile and shaly, dark ferruginous, with carbonaceous material staining surfaces.
20. 1'. Sandstone, rather gray and micaceous.
19. 8'. Shaly sandstone.
18. 3'. Sandstone jointed, gray, hard, and indurated.
17. 25'. Shaly beds, crumbly brown bed, covered by slide of ledge above.
16. 12'. Sandstone, forming persistent ledge, well jointed, very hard, and holding lenses of brown cemented rock in lower part.
15. 1'. Green ledge of crumbly rock.
14. 9'. Shaly rock.
13. 6'. Sandstone, massive.
12. 5'. Shaly brown beds.
11. 3'. Sandstone, massive gray, cross bedded, thickens to north and thins out to south.
10. 12'. Splintery shale, greenish brown.
9. 3'. Sandstone, massive.
8. 8'. Shale, splintery, crumbly, green micaceous.
7. 2'. Limestone, dark blue.
6. 5'. Crumbly brown shale.
5. 3'. Gray sandstone.
4. 5'. Sandstone, green earthy, fracturing.
3. 30'. Massive sandstone, probably Laramie.
2. 20'. Shale, dark gray, carbonaceous, with thin layers of sandstone.
1. 50'. Massive sandstone.

The Blue rim section shows beds of water-laid sandstones and shales at the base, while the sandstone forming the blue cliffs are made of volcanic detritus, the finer-grained rock and the shaly beds being of volcanic ash and showing but little assorting. Plant impressions occur near the top of the section and prostrate tree trunks of silicified wood are seen. The shale belts are peculiarly inconstant, and the brown color is the result of the oxidation of the fine-grained green rocks.

An examination of thin sections of the rocks of the Blue rim section under the microscope, made by Mr. J. P. Iddings, show that the sandstones at the base consist of well-rounded grains of Archean material, mainly quartz, well assorted and quite like the sandstones of the Laramie Coal-measures of other places. Fifty feet above the basal sandstones the rock shows, in thin section, decidedly angular grains of plagioclase, quartz and a little mica, and though but one fragment of andesite is seen in the slide the rock has more the appearance of a volcanic ash than a true sandstone. Still higher in the section the sandstone (No. 16) is formed of rounded grains of Archean material, but above this the rocks show in thin sections a decidedly volcanic nature, consisting of fine fragments of pyroxene andesite and andesitic breccia. The shaly strata are formed of so fine an ash that but little can be distinguished in thin section, but they grade into the coarser beds whose composition is clearly volcanic.

DISTRIBUTION AND CHARACTER.

Followed westward the beds of the Blue rim increase in thickness and include more water-worn material, the tuff beds becoming less prominent. The rocks form picturesque combs along the valley of Little Mission creek and are well exposed where the Blue Rim syncline is cut across by Mission creek above the forks. At this place the rocks consist of brownish ash beds overlain by green fissile sandstones and conglomerates. In the walls of McAdow canyon of the Yellowstone the beds are well exposed and their relation to the coal rocks clearly seen. At this locality the shaly beds are often quite carbonaceous and contain an abundance of plant remains and a few fresh-water shells.

At Livingston fine exposures of the formation occur in the hills north of the town, where the beds dip at 10° northward. The rocks are dark chocolate colored or green sandstones, carrying lenses of fine grained tuff-like rocks, that contain plant remains. Local beds of volcanic débris, showing little if any water-assorting, also occur. In the sag between the two hill tops, an opening has been made on a two-foot seam of impure lignite, overlaid by a thickness of several hundred feet of sandstones that are locally conglomeratic.

A detailed section of the beds of the Livingston formation at Cokedale would be of little value, as the beds vary rapidly from quite fine-grained sandstones to coarse grit, with thin intercalations of conglom-

erate. Thin sections of the rocks, when seen under the microscope, show a variation in the amount of Archean material present. The rocks immediately overlying the coal are good sandstones, harder than those associated with the coal, but water-laid and formed of assorted water-worn grains. The rocks above change rapidly, however, to coarse-grained sandstones of angular fragments, showing but little assortment. Many of the rocks resemble a fine-grained volcanic agglomerate in the hand specimen, while the finer layers that crumble into small angular bits are volcanic ash beds. There is a noticeable admixture of Archean detritus with the volcanic grains of some of the ledges, but the latter largely predominate and frequently form the entire rock. At some 2,300 feet above the coal the Archean material is very abundant, showing a cessation of the ash showers, but the grits above and those associated with the shales of the Billman creek valley are wholly of volcanic material.

In the exposures of Rocky canyon and vicinity, from which the larger part of the plant remains obtained from the Livingston beds have been taken, the rocks immediately overlying the workable coal seam at the top of the Laramie are dark green or brown and resemble fine volcanic tuffs made up of andesitic débris, overlaid by grits and sandstones, with conglomerate intercalations, at 400 feet above the coal. Leaf remains occur at various horizons, but the collections all come from the lower 500 feet of the formation.

Upon the eastern flanks of the Bridger range, and northward to the Castle mountains, the leaf beds possess the same general characters. Hard sandstones of varying texture and grain, generally dark colored, and rarely conglomeratic, alternate with dark olive brown shales, that are hard and indurated, but crumble into fine angular bits. The conglomerates are composed almost wholly of pebbles of andesitic materials, but pebbles of white, brown, and blue quartzite occur sparingly, together with rounded fragments of coal and normal sandstones. Intercalations of volcanic agglomerate occur on the slopes of the Bridger range at Flathead pass, and farther north, about the headwaters of the Musselshell.

Fine exposures of this lower division of the Livingston occur in the hills drained by Cottonwood creek, where they rest upon the Laramie. The lowest beds are seal brown, very fine-grained sandstones, containing fossil plant remains in abundance, overlaid by coarser, lighter-colored sandstones and grits, which at higher horizons are interbedded with soft shales. In the exposures at the head of Smith river, near Castle, a few gasteropod shells and *Unio* remains were found in the finer-grained beds. In this vicinity the first marked change is observed in the beds. Throughout the region north of the Crazy mountains a prominent bed of white calcareous sandstone occurs, interbedded with the dark colored sandstones, grits, and shale beds of the Livingston, about 500 feet above the base. No fossils were observed

in this rock in the vicinity of Castle, but near the forks of the Mussel-shell river this bed is composed of brackish-water shells of Laramie types. The northern portion of the Crazy mountains is composed very largely of Livingston rocks. A section made along Lebo creek east of the mountains showed a total thickness of 7,100 feet of Livingston sediments, in which the lower beds do not form so distinct a division as elsewhere in the neighborhood of the Crazy mountains.

In the mountainous region south of the Gallatin valley the only exposure of the Livingston is in the Madison range, where the beds cover an area of 15 to 20 square miles in the vicinity of Sphinx mountain. They are thus described by Dr. A. C. Peale: "The strata consist of indistinctly bedded volcanic material, mostly andesitic in nature, and of a somber hue. At one or two places conglomerates made up of all sorts of pebbles are seen near the base." The beds rest unconformably upon the eroded edges of all the Cretaceous formations, and are unconformably overlain by the coarse conglomerates assigned to the Eocene. On the eastern flanks of the Jefferson range another exposure of the Livingston occurs. The beds present a somewhat different aspect from those just described, not being so dark in color and showing more distinct evidences of bedding and seemingly more nearly conformable to the underlying Laramie beds with which they are in contact. In the vicinity of the Jefferson canyon they have a dark greenish-gray color, and apparently contain interbedded hornblende andesites, which seem to have been laid down as lava flows. Other beds are conglomerates composed of all sorts of volcanic material, andesites, however, as at other localities, apparently predominating. The period during which they were deposited was undoubtedly one of great volcanic activity.

The water-laid beds of the basal portion of the formation thus far described contain but small and local bodies of conglomerate. In the section which has already been given, made in the vicinity of Cokedale, these beds have been estimated to be 2,400 feet thick. In the Blue Rim section, which does not embrace the entire thickness, there is some 600 feet, and on the Boulder river, where they are capped by the volcanic agglomerate, the total thickness is not thought to exceed some 700 feet.

THE VOLCANIC AGGLOMERATES.

Beds of consolidated volcanic ejectamenta form the mountains of the western part of the Crow Indian reservation and terminate the Bozeman coal field at the Boulder river. These agglomerate beds rest directly upon the lower beds of the Livingston formation, and thinning out westward are overlain by the upper part of the same formation, capped in turn by the great thickness of sandstones and clays forming the Crazy mountains.

The volcanic agglomerate attains its maximum development in the region drained by the Boulder river. This stream is a clear mountain torrent, heading in the high plateaus and peaks north of the Yellow-

stone park, and emptying into the Yellowstone river at Big Timber. In its lower course below the forks the valley is cut in the volcanic agglomerates, which weather into castellated knobs and mural faces, adding much to the picturesqueness of the scenery. At the forks of the stream the Laramie Coal Measures dipping northward are overlain by the dark-colored rocks of the Livingston formation, readily distinguishable by their color, fracture, and weathering. The upper parts of this section are cross bedded, poorly assorted sandstones, very clearly of shallow water formation. The grains are angular, but little water worn, though not less so than the rocks of the Blue Rim. A careful examination shows at a number of localities a decided unconformity between the beds at the top of the series and the overlying agglomerates. At other localities there is an apparent gradation of the water-laid strata into the fine breccias, so that the section shows distinctly water-laid beds capped by a series of strata in which those beds alternate with beds showing no traces of such action. The latter become more frequent in ascending the series until the rocks are all fine-grained breccias that pass rapidly into the coarse volcanic agglomerates made up of large angular fragments of andesitic lavas. The agglomerate beds are very light colored, possessing in a general view a warm gray tint. The fragments composing them are of various tints of gray, brown, lilac or green, the last color often predominating. There is a rude bedding brought out by the rapid weathering of fine-grained material forming thin intercalations rarely more than a few inches thick. The agglomerate fragments range in size from minute particles up to blocks four feet in diameter, though seldom so large as the latter. The lavas from which the agglomerates are formed are all andesitic, the rocks possessing but slight variations in character. Augite-andesite is often conspicuous, the large augite phenocrysts being very abundant. In several large blocks of basic-looking andesite large isolated hornblende prisms were noticed. As a whole the rocks though so light colored, are decidedly basic and in thin section are seen to be pyroxene-andesite.

These agglomerates represent the products of explosive volcanic action from a vent on the shore or in the shallow water of the lake whose sediments formed the Livingston beds. The flanks of the cone built up of this volcanic débris were covered by the lake waters in the subsidence that caused the deposition of the great thickness of sandstones and clays that form the Crazy mountains.

DISTRIBUTION.

In the valley of the lower course of the Boulder river the total thickness of agglomerate interbedded between the Livingston rocks is estimated to be at least 2,000 feet. The beds dip at a low angle downstream and are seen to be overlain by sandstones and purple clays a few miles above Big Timber, frequent sections being exposed in lateral stream cuttings.

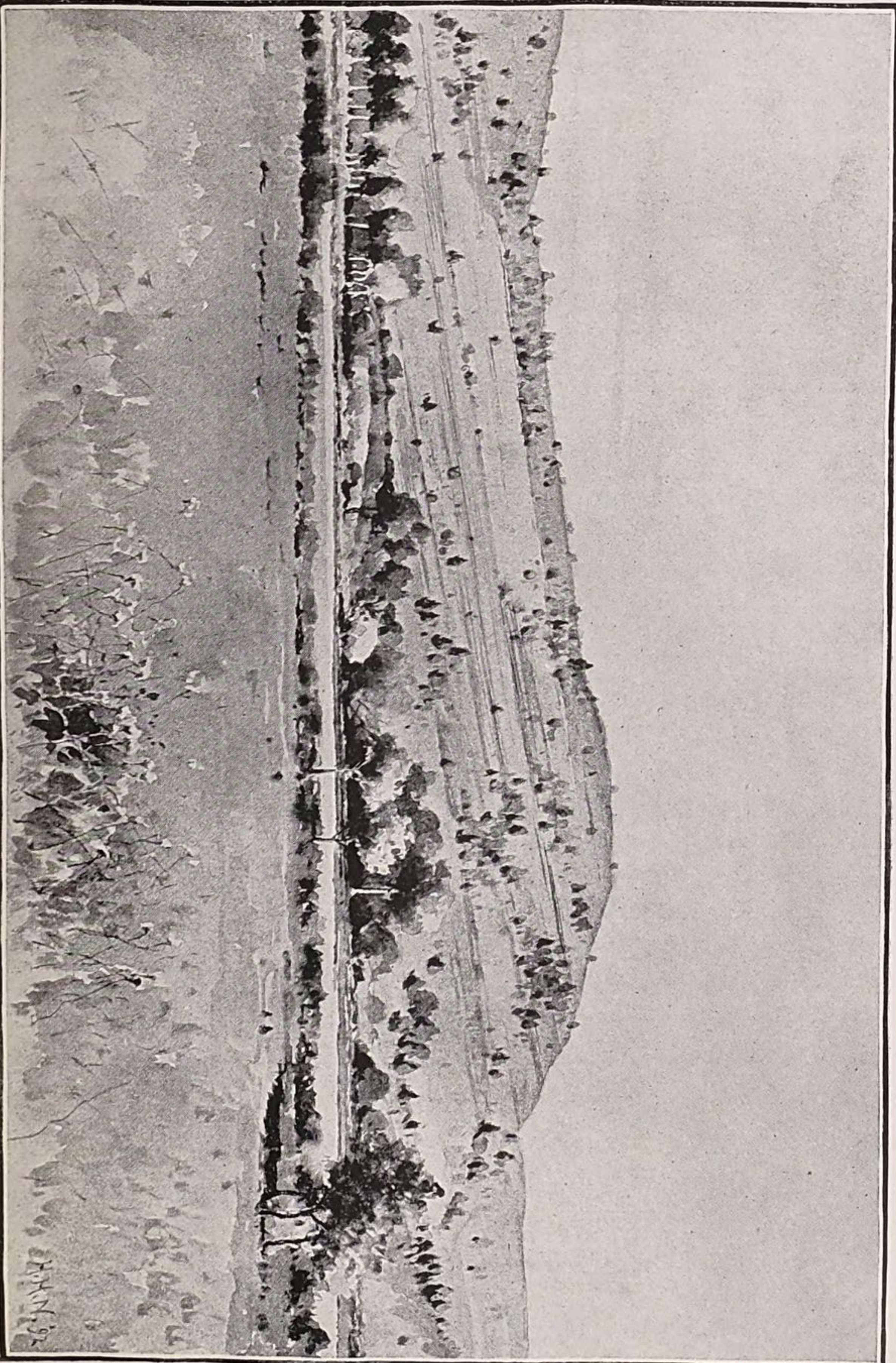
East of the Boulder river these agglomerates form the highly accented country of the Crow reservation, where they rest upon upturned and eroded Mesozoic rocks. In this region a thickness of over 2,000 feet was observed in a canyon where the underlying rocks were not exposed to view. A portion of this breccia is, however, believed to represent subaerial accumulations deposited contemporaneously with the water-laid strata that cover the agglomerates near Big Timber.

Followed westward from the Boulder river the agglomerates are exposed as far as McAdow canyon and Hunter's hot springs. In the hilly country between the Boulder and Yellowstone rivers the agglomerates are of little moment in the topography; gentle grassy slopes fall off gradually to the broad cobble-covered terrace flats that border the Yellowstone river. In this region exposures must be sought in the rocky walls of the little canyons cut by the branching headwaters of Mendenhall and Antelope creeks. These exposures show a gradual thinning out of the agglomerates to the north.

In the bold bluffs facing the river near Springdale, a railroad station 25 miles east of Livingston, the rocks dip at an angle of 15° eastward, showing the influence of the McAdow canyon folding. The Springdale bluff shows a thickness of about 700 feet of breccia, resting upon typical Livingston beds and covered by the purple clays and lilac sandstones that prevail eastward. The cliffs are some 200 feet high, formed of light-colored agglomerates that, when seen at a little distance, closely resemble ordinary sandstone. The base of the section consists of dark tufaceous sandstones resting upon the water-laid beds of the Livingston series. The lowest ledge of the Springdale bluff is a very hard and dense, almost black, sandstone, very brittle, and breaking into angular *débris*. It is immediately overlain by a ledge locally characteristic of the base of the breccia. This rock is full of dark brown, round concretions, 1 to 2 feet in diameter, that resemble cannon balls. The "cannon ball" bed is overlaid by beds of fine volcanic material resembling a coarse and poorly assorted volcanic ash showing no evidence of water action. These ash beds are in turn overlain by a second cannon-ball ledge in which the concretions are much smaller. Above this last bed fine-grained agglomerates and very coarse agglomerates alternate in rapid succession and without persistence of horizon. The fragments composing these agglomerates of the Springdale block are andesitic lavas identical with those forming the beds of the Boulder river; green, brown, lilac and gray in color and varying in size from fine lapilli to blocks of 5 feet across (see Pl. II).

In the bluffs of Mendenhall creek east of Springdale station the same rocks are exposed underlain by the cannon-ball beds and resting upon the earthy brown and splintery shales and sandstones of the Livingston series. East of Mendenhall creek the agglomerates are covered by the overlying sandstones.

The most northern exposure of the agglomerates yet found is near



TILTED AGGLOMERATE BEDS NEAR SPRINGDALE, MONTANA.

H. H. N. 92

that local health resort, Hunter's hot springs, some 3 miles north of the Yellowstone river. In this interval the agglomerates thin out rapidly, and in the section exposed by the creek a mile west of the hot springs, just south of the wagon road, the conglomerate is but 25 feet thick and rests unconformably upon the sandstones beneath. The upper surface is uneven and covered by the lilac sandstones and purple shales that usually are above it. (See fig. 1.) There is a general de-

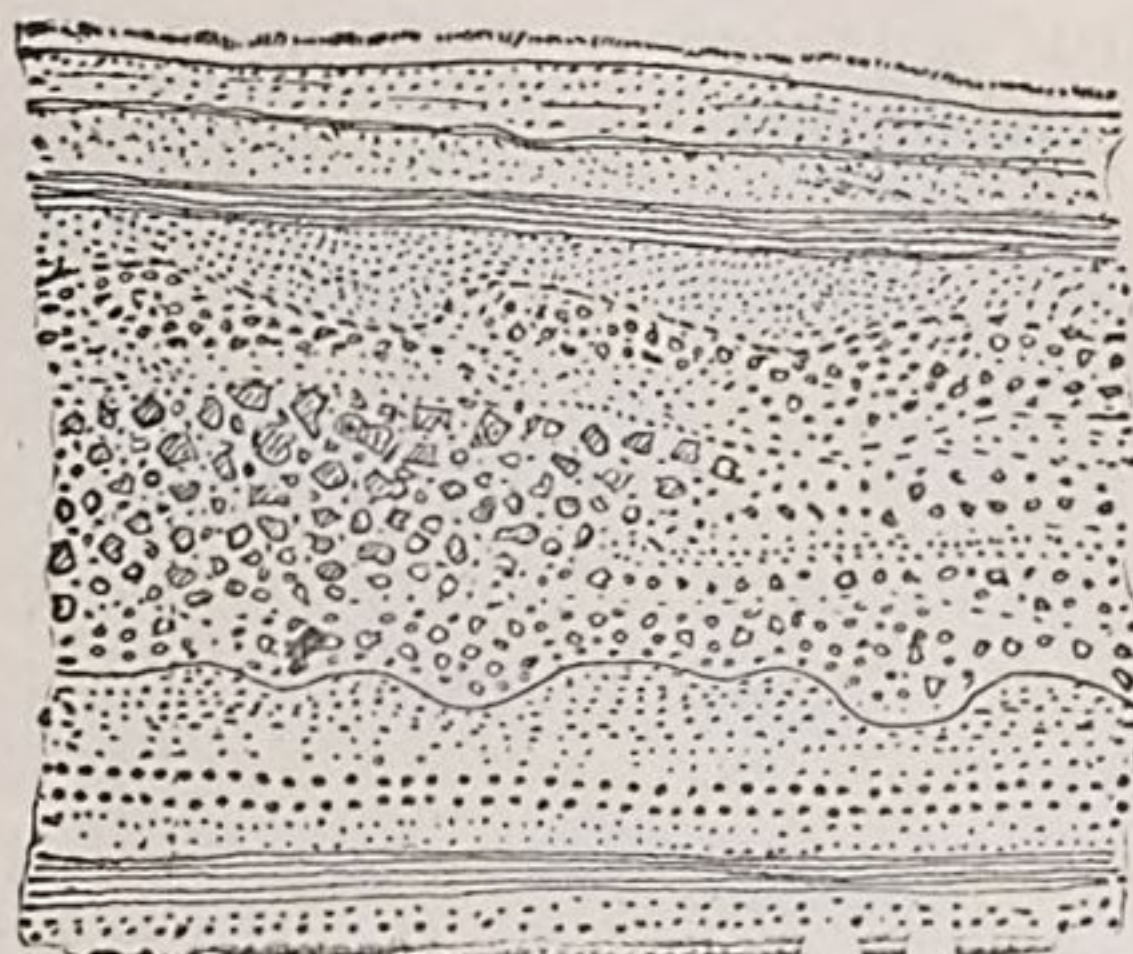


FIG. 1.—Diagrammatic section at Hunter's Hot Springs.

crease in the size of the fragments, as well as the thickness of the beds, from the Boulder river northward. In the area thus far mapped and studied the volcanic agglomerates cover about 75 square miles. They also extend over a larger area in the western portion of the Crow Indian reservation.

Small and local intercalations of volcanic ejectamenta showing no assortment or rounding by the action of water, occur, however, at a number of localities in the lower part of the Livingston formation. Such accumulations are prominent in the vicinity of Flathead pass, and at the head of Smith river, near the mining camp of Castle. The beds exposed east of the Crazy mountains frequently consist of finer grained material, which, in thin section under the microscope, is seen to be a good pyroclastic rock. The areas of Livingston rocks in the Madison range and along the Jefferson river, described by Dr. A. C. Peale, also consist in part of true volcanic accumulations, the latter exposure showing interbedded lava flows.

RELATIONS TO LEAF BEDS.

A gradual increase in the thickness of the beds is noted in tracing the thinning out of the agglomerates, and the thickness at Cokedale corresponds approximately to that of both the agglomerates and underlying beds together of the eastern localities. It is supposed that in a general way the deposition of the subaerial agglomerates was synchronous with the formation of littoral deposits of debris washed down from the slopes of the neighboring volcano, making beds of a somewhat higher horizon than those beneath the agglomerate. At the same time

there was a shore to the westward supplying Archean débris which mixed with volcanic particles appears in increasing quantity as the rocks are followed westward from the Boulder.

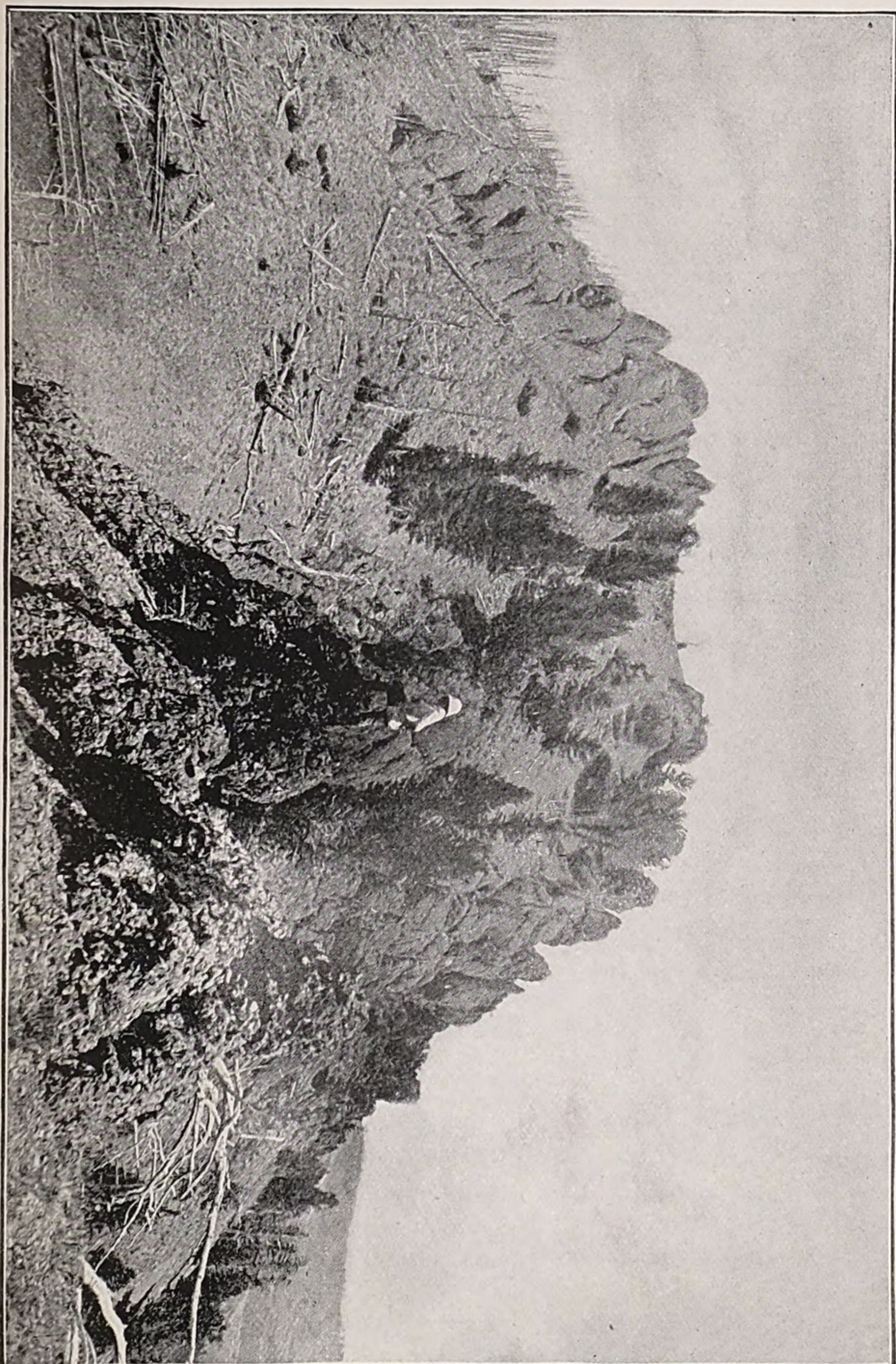
LIVINGSTON CONGLOMERATES.

The upper portion of the Livingston is for convenience designated by this name, as the conglomerates form the most important and often the most conspicuous beds of this part of the formation.

Overlying the leaf beds and volcanic agglomerates there is a series of shales and interbedded sandstones and grits that form a prominent part of the formation wherever the upper portion is exposed. In the eastern part of the region the sandstones are fine and uniform in grain, making an excellent building stone in the vicinity of Big Timber. Traced westward these beds are easily recognized by their red soils that form the terrace flats to the south of the Yellowstone river as far as Springdale. Beyond here they form the low hills and the country north of Livingston. It is in these same shales that the valley of Billman creek has been cut, and they have also afforded the material out of which the long strike valley east of the Bridger mountains has been eroded. In the extension of these beds westward there is a general persistence of character of the shales themselves, but on the other hand the thin beds of "freestone" of the east change in character, become coarser, and in the Billman creek valley form lenticular bodies of coarse and illy assorted grits and conglomerates. Northward the open valley of Flathead creek and the synclinal basin north of the Shields river valley are both eroded in this part of the Livingston formation. The exact nature of the soft clayey shales it is difficult to make out; they crumble readily, are sometimes quite micaceous, and change from green to red on weathering. Thin sections of the associated sandstones show them to be made of volcanic material, grains of andesitic breccia forming a considerable part of the mass. This series of beds has thus far failed to yield any fossil remains.

Overlying the series of purple shales just described, the rocks are chiefly sandstones and conglomerates. They do not form a distinct conglomerate bed throughout the field, but rather a series of sandstones and silty shales holding intercalated beds of conglomerate, the latter rocks becoming more prominent toward the west, and attaining their maximum and most prominent development along the eastern front of the Bridger range. That they form a true part of the series is indicated by their composition and by the gradual transition of the underlying beds into the conglomerate series. Because of their coarser nature a study of the pebbles is more easily made in these beds, and this has been most feasible in the exposures of the western part of the field.

Near Hunter's hot springs the monoclinal ridges back of the hotel are formed of sandstones belonging to this horizon that include lentic-



CONGLOMERATE BEDS FORMING ANTICLINAL RIDGE BETWEEN BRACKETT AND FLATHEAD CREEKS.

ular intercalations of conglomerate, in which, besides the usual variety of volcanic rocks, gneiss, quartzite and limestone pebbles were recognized. These ledges are overlain by sandstones and purple clays that represent the higher part of the formation. At the mouth of Shields river the sandstones interbedded with the purple and green clays are dark and greenish in color and contain conglomerate layers with quartzite and limestone pebbles.

From Big Timber westward the grains forming these rocks become very slightly coarser and in the high hills east of the Bridger range become conglomerates. These hills are separated from the mountains by a long strike valley cut in the purple shales and drained by Bridger and Brackett creeks. The cliffs east of these creeks show a thickness of over 2,000 feet of sandstones, conglomerates, and sandy shale. Several detailed sections were made, but are of little general interest, save to show the proportion of conglomerate. Brown earthy-colored sandstones grade rapidly into conglomerates and alternate with gray, silty, incoherent clay shales. The rugged ridge separating Brackett creek from the flat valley to the north is formed by a sharp anticlinal uplift of these conglomerates. Plate III shows the ledges on the summit of the ridge. The importance which attaches to these conglomerates arises from the light they throw upon the relation of the Livingston formation to the Laramie, and to the post-Laramie movements which elsewhere had been found to be so important. The large size of the pebbles of the conglomerate permits a ready recognition of their lithological nature, and this upon examination proves to be of the greatest interest. In the cliffs east of Bridger creek and the ridges cut by Brackett creek, the conglomerates of the series occupy a very prominent part of the formation. The accompanying illustration (Pl. IV) shows the size and well-rounded character of the pebbles forming the conglomerates. It is reproduced from a photograph. Sections made near Stone's creek and on Brackett creek show a thickness of 2,000 feet of very coarse sandstones and conglomerates in which a large number of pebbles are noted that are not of volcanic origin. In both these sections the conglomerates contain pebbles of granite, quartzite of various colors, limestones showing chert and carboniferous fossils, and cretaceous shales and sandstones. The volcanic rocks also show a wide variety; whereas the pebbles of the lower beds show but little variety of the andesite, those of the higher strata exposed at Bridger and Brackett creeks contain olivine porphyrite, hornblende-porphyrity, pyroxene-andesite, quartz diorite, and dacite. The first of these rocks is unknown elsewhere in this region. The dacite occurs as an intrusion in the Laramie Coal-measures.

There is some evidence that may prove sufficient cause for a separation of these conglomerates and silts from the Livingston formation and their recognition as the base of the Fort Union group.

MATERIALS COMPOSING THE LIVINGSTON.

The peculiar appearance of the rocks overlying the coal beds of the Bozeman coal field was noticed by the geologists of the Hayden Survey,¹ but the volcanic nature of the pebbles was first established by the geologist belonging to the Northern Transcontinental Survey, by whom descriptions of the conglomerates were published.²

The general appearance of the coarse sandstones of the lower part of the formation suggests the volcanic nature of the materials composing them. In the hand specimen particles of andesite are frequently distinguishable, and the opaque white feldspars derived from the andesites are always a conspicuous feature of the rocks. The conglomerates of the leaf beds, though always of merely local development, are frequently prominent parts of the outcrop. The pebbles of these conglomerates are almost wholly andesitic in character, the rare exceptions being a few pebbles of quartzite found at a few localities at this horizon.

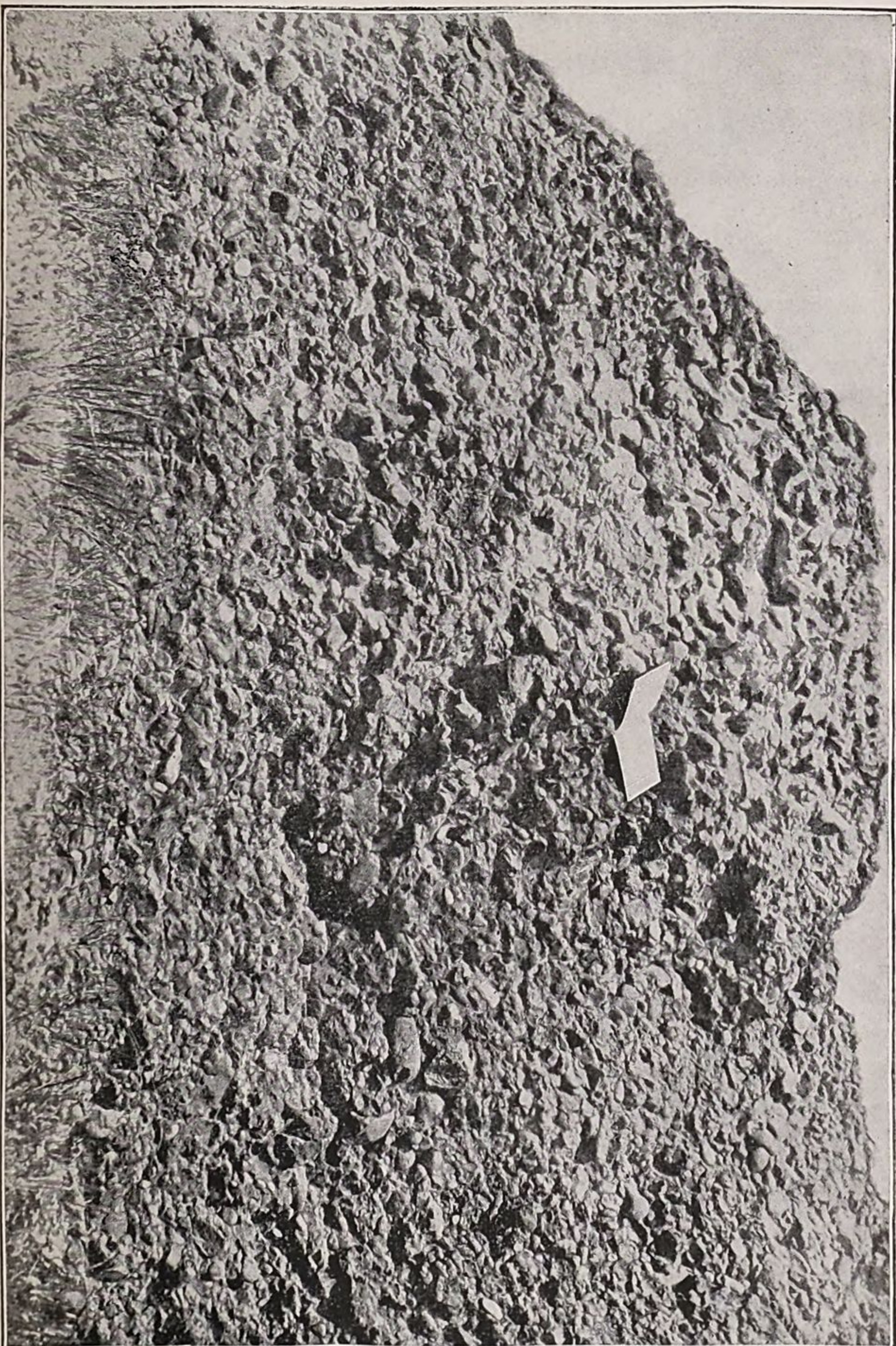
Microscopic examinations of the rocks show a mixture of volcanic with archean material. The character of the rocks of the Blue rim section has already been stated. That of the strata in the vicinity of Cokedale is typical of this formation generally. The lower 1,000 feet of beds show an admixture of andesitic débris with Archean material, the latter being much more abundant than in the rocks of the Blue rim, but in widely varying quantity at different horizons. Many of the Cokedale rocks show no assortment of the grains, as there would be if there had been wave action during their deposition, and they probably represent ash showers. The andesites are all of types represented by the intercalated volcanic agglomerates, described later. Thin sections kindly examined for me by Mr. Whitman Cross show the rocks overlying the coal near the Chestnut mine to be composed of fine to coarse andesitic débris but little different from that seen in thin sections of rocks from the same horizon north of the Crazy mountains.

The conglomerates of the upper part of the formation show a much wider variety in composition. Inconspicuous features in the exposures east of Livingston, they form the high hills east of the Bridger range, where they attain their greatest development and become less and less prominent parts of the formation northward. In the hills just mentioned the conglomerates consist of well-rounded pebbles up to 10 inches in diameter, which, though chiefly of volcanic rocks, are of many types, and include moreover a conspicuous proportion of other rocks. Microscopical examinations show the following variety of igneous rocks:

- Olivine-porphyrity.
- Hornblende-porphyrity.
- Pyroxene-andesite.
- Quartz-diorite.
- Dacite (or rhyolite?).

¹Dr. A. C. Peale, Ann. Rept. U. S. Geol. and Geog. Survey, 1871, pp. 49, 173; idem, 1872, pp. 25, 112.

²Waldemar Lindgren, vol. xv, Tenth Census U. S., p. 725.



CONGLOMERATE BEDS SHOWING SIZE AND ROUNDING OF PEBBLES.

Pebbles of Archean, gneisses, and quartzites also occur, together with limestones showing Paleozoic fossils and Dakota conglomerate.

FOSSIL REMAINS OF LIVINGSTON FORMATION.

The fossils of the Livingston formation consist of plant remains, found most abundantly in the southern exposures, throughout the Bozeman coal field, and a meager molluscan fauna most abundant in the extreme northern portion of the Crazy mountain country.

FOSSIL FAUNA OF THE LIVINGSTON.

The molluscan remains are of two kinds, fresh-water and brackish-water forms. The former occurs together with leaf remains in the cliffs of McAdow canyon of the Yellowstone and at the headwaters of Smith river. At the first locality *Unio* remains, specifically indeterminable, and fragmentary gastropods have been collected. At the head of the south fork of Smith river a small collection of fossils was obtained from the black calcareous shales of the formation, but the shells have been deformed by the flexing of the strata. *Unio* remains are abundant, but can not be preserved. The other shells brought are abundant and have been examined for me by Mr. T. W. Stanton, who reports as follows: "The fossils from this locality are very imperfectly preserved and the identifications are too doubtful to be of value. All that can be said of them is that they are fresh-water forms having some resemblance to species from the Fort Union bed near Fort Union and at the mouth of the Yellowstone, as follows:

1. *Goniabasis tenuicarinata* M and H.
2. *Goniabasis nebrascensis* M and H.
3. A third form represented by a single mold resembles *Thaumastus limnæiformis* M and H, a land shell."

In the region northeast of the Crazy mountains, drained by the Musselshell river, a bed of limestone full of shell remains occurs, interbedded with the Livingston sandstones and conglomerates, a few hundred feet above the base of the formation. The species obtained from this bed, are thus described by Mr. Stanton: "The three species and one variety in this lot are all brackish-water forms, and were all originally described from the Judith river beds near the mouth of Judith river. The *Corbicula* and the *Corbula* have been found in the Laramie of the valley of Bitter creek, southern Wyoming, and the *Corbula* ranges well down in the marine Cretaceous. There is no doubt that these fossils came from the Laramie.

1. *Ostrea subtrigonalis* M. and H.
2. *Corbicula cytheriformis* M. and H.
3. *Corbula subtrigonalis* M. and H.
4. *Corbula subtrigonalis*, var. *perundata*, M. and H.

The horizon from which these brackish-water forms were obtained is below that at which the fresh-water mollusks were found.

FOSSIL FLORA OF THE LIVINGSTON FORMATION.

The abundance of fossil plant remains in both the true Laramie and the Mission creek formations has already been noted. Collections were made from both horizons as early as 1871 by Dr. A. C. Peale and other members of the Hayden Survey, and together with further collections made in 1872 and 1878 were submitted to Prof. Leo Lesquereux. In subsequent years the collections were largely increased by Dr. Peale, Prof. F. H. Knowlton, and the writer. At my request a careful revision of this work, together with a study of all other material from the same region, was undertaken by Prof. Knowlton, and his report is a very important contribution to the paleobotany of the Laramie. This work not only describes and tabulates the species collected from the Laramie Coal-measures and those from the Livingston formation, but it clears up the confusion resulting from the mixing up of collections from various horizons and localities described in the early reports of the Hayden Survey, a work so frequently referred to in the literature of the Laramie. As many of Lesquereux's type species of Laramie plants were in these collections, the importance of a careful separation of collections from different localities and horizons will be readily appreciated. This necessitated a careful examination of each specimen of the Hayden collections. This has been done by Dr. A. C. Peale, by whom most of the specimens were obtained. This has shown that fossil plant remains from both the Laramie Coal-measures and the Livingston formation were placed together, and with specimens from the volcanic rocks of the Yellowstone park were described as Laramie species. The latter have been separated out and the specimens from each locality and horizon in the Bozeman district discriminated. The collections studied by Prof. Knowlton are from five different localities and represent two horizons, viz, first, Laramie Coal-measures, and, second, the Mission creek formation. The first includes the specimens labeled Bear creek, Fir canyon, and Fort Ellis, Chestnut and the Craig and Horr mines (Cinnabar field). The specimens labeled Hodgson coal mine, Flathead pass, Mission creek and Bear creek (Madison valley) are from the lower portion of the Livingston formation, and can be readily distinguished by their volcanic matrix from the specimens obtained from the Laramie rocks.

In the accompanying report Prof. Knowlton has shown the similarity of the flora of the Livingston beds with that of the Denver formation, and the table of distribution and the relative abundance of certain species show quite clearly that the flora of the Livingston is distinct both from that of the Laramie and that of the Fort Union formation.

UNCONFORMITY BETWEEN LARAMIE AND LIVINGSTON FORMATIONS.

Unconformity between these two formations has been observed by Dr. A. C. Peale in the vicinity of Sphinx mountain in the Madison range. At this place an area of Livingston beds, representing the

lower part of the formation, rests in marked angular unconformity upon the Dakota, and all later formations including the Laramie. An uplift, followed by an erosion of about 3,000 feet of strata at the close of the Laramie and before the deposition of the Livingston, is quite clearly evidenced. Throughout the region east of the mountains examined by the writer, the Livingston beds have not been found resting upon strata older than the Laramie. Considerable variations in the thickness of the latter are believed, however, to be in part due to a period of erosion preceding the deposition of the Laramie.

Undoubted proof of unconformity between the two formations is, however, afforded by the pebbles of the conglomerates of the Livingston. The Cretaceous section up to and including the Laramie affords proof of considerable oscillation of sea and land, but there is good ground for believing that the earlier sediments of this age were nowhere elevated and subject to erosion. The sandstone and conglomerates of the Laramie all indicate their derivation from Archean land. No fragments of other rocks have yet been observed. In the Livingston, on the contrary, there are pebbles from all earlier rock masses, indicating very clearly the erosion of adjacent land masses consisting in part of upturned sedimentary rocks and forming the record of a period of erosion of 6,000 feet or more of strata. The conglomerates contain pebbles referable by fossils or lithological peculiarities to the Laramie, Montana, Colorado, Dakota, Jurassic, and Carboniferous, together with others of limestone that may be Cambrian, and a variety of quartzites and gneisses that are probably Archean. This lithological proof of a great unconformity is in itself a sufficient cause to disregard the apparent conformity of the two formations in the region east of the uplifts of the Front ranges. It is evident moreover that the slight erosion of this region, and the horizontal attitude of the strata during the erosion interval, would necessarily make an unconformity less marked and much harder to detect in this region than nearer the shore line where the coarser sediments and the greater uplift and erosion all reduce the unconformity more apparent.

THE FORT UNION FORMATION.

In the Crazy mountains and the broken plains country to the east the Livingston is overlaid by a series of beds, believed to be a distinct formation, corresponding in stratigraphic position and fossil contents to the beds exposed along the Missouri river at the mouth of the Yellowstone, so long known in geological literature as the Fort Union beds. A detailed description of this formation will not be given here, as it will be discussed in another paper. The formation consists of rather massive, cross-bedded sandstones, with gray, silty shales and local lenses of impure limestone. In lithological habit and general field appearance the formation is easily distinguished from either the Laramie or Livingston rocks, and its fossil contents consist wholly of

land and of fresh-water mollusks, and of plants characteristic of the Fort Union of the Missouri river. A measured thickness of 4,000 feet was observed overlying the Livingston, on Labor creek east of the Crazy mountains. The rocks of this formation have never been found west of the foothills of the Rocky mountains, but cover the greater part of the plains to the eastward.

AGE OF THE LIVINGSTON FORMATION.

The different views held by geologists upon the age and relations of the Laramie group, are due to a fundamental difference in the definition. The name was originally applied by King to the series of conformable sediments ending the marine Cretaceous.¹

A very much wider significance was given to the term Laramie by Dr. White, who correlated the various lignite-bearing strata of the Rocky mountain region, under the name Laramie group. Thus defined the name included formations which further researches show to be distinct in both stratigraphic relations and paleontological remains.² It is evident also that collections of fossils from this heterogeneous group of strata, having been described as from the Laramie group, have made the so-called Laramie flora and fauna an unreliable criterion, by which to distinguish true Laramie from post-Laramie strata.

The facts of stratigraphy and of lithology herein presented demand the recognition of the importance of the interval between the Laramie and the Livingston deposits. The importance of this interval is also shown by the plant remains of the two formations, which present such differences and biological development as fully sustain the deductions from stratigraphical evidences. It should be stated, however, that it is only now, since the thorough revision of the flora of the so-called Laramie, in which the collections from the Denver and the Fort Union have been separated, that such evidence is of value.

Unfortunately, the known molluscan remains do not aid us in determining the importance of this erosion interval, because the invertebrate fauna of the Laramie is as much in need of revision as the fossil flora. It has been repeatedly stated, by eminent paleontologists, that sedimentation has been continuous and uninterrupted from the beginning of the Laramie to the end of the beds called Fort Union, which are, in this paper, separated from the Livingston as a higher series. The fossil fauna has been said to be the same from base to top throughout this series. A careful tabulation of species from different horizons shows, however, that this is not true in the collections made from the vicinity of the Crazy mountains.

The oyster bed, found in the Livingston, clearly shows an interval of

¹Rep. Fortieth, Par. Survey, vol. I, p. 331.

²The Denver Tertiary Formation; Am. Jour. Sci., April, 1889. Post-Laramie Deposit of Colorado; Am. Jour. Sci., July, 1892.

quiet, succeeding the formation of the sandstones and grits of volcanic material, during which the beds were covered by brackish waters.

The fresh-water invertebrate fossils, at higher horizons, seemingly indicate a change in the character of the waters, and the final recession of the sea. The fossils of the oyster bed are, however, indetical with forms characteristic of the Coal-measures of the Laramie, underlying the Livingston in this same region, and therefore they can not be used as an argument for the separation of the two formations, but clearly show the existence of a Laramie fauna in brackish waters, after the deposition of several hundred feet of Livingston beds. It should be stated, however, that none of the conglomerates of the formation, in the region in which the oyster bed is found, contain pebbles indicating unconformity. It is indeed possible that these beds are incorrectly assigned to the Livingston, and should be classed as Laramie.

As the stratigraphical evidence herein presented shows an uplift, followed by a period of erosion after the deposition of the Laramie Coal-measures, and before the Livingston period, and the plant remains show a flora distinct from the Laramie flora, and allied to that of the Denver beds of Colorado, the Livingston beds are clearly to be assigned to the post-Laramie.

The facts discovered make it necessary to limit the use of the term Laramie to the original definition, which applied the name to the strata ending the sequence of conformable sediments of Cretaceous age; this leaves no alternative but to call the Livingston beds post-Laramie. Such a designation will, of course, be questioned by those using the term Laramie in a broader sense. The great thickness of beds overlying the Livingston formation, aggregating some 8,000 feet of strata and forming the Crazy mountains, has thus far proved too barren in fossils to assign positively any definite age to the strata. Upon lithological grounds and from its stratigraphical position it is regarded as an equivalent of the Fort Union strata of eastern Montana. This is supported by the leaf remains obtained from the beds.

CANADIAN NOMENCLATURE.

In the northward extension of the Great Plains and the foothills of the Rocky mountains into Canadian territory, the careful work of the geologists of the Canadian Geological Survey has added much to our knowledge of the Cretaceous terranes. Both Dr. Dawson and Mr. Tyrrell have subdivided the great thickness of strata found overlying the Montana group into series stratigraphically distinct. Though the term Laramie group is retained for the entire thickness, Tyrrell states clearly that the lower of the two series into which he divides the strata (*i. e.*, the Edmonton beds) is alone entitled to that name. The overlying Paskapoo series he considers distinct, and though there is no apparent break or unconformity between them and the Edmonton, the flora and fauna indicate an Eocene age. These beds are probably identical with the Fort Union group of Montana.

The Edmonton is described by Tyrrell as the most characteristic series of the Northwest territory, for although its thickness never exceeds 700 feet the strata are horizontal and overlie a great extent of country. They consist of whitish or light gray clays and soft clayey sandstones weathering rapidly and into rounded outcrops. The beds are frequently seamed with layers of ironstone whose nodules cap pinnacles cut in the soft sandrock. It is essentially a coal horizon and of considerable economic importance. The fossil fauna and flora includes a number of brackish-water shells, and dinosaurian remains and plant remains closely related to the Belly river, and of unquestioned Laramie types.

The Paskapoo beds include all the rocks generally ascribed in this part of Canada to the Laramie that overlie the Edmonton series. A thickness of 5,700 feet is exposed on the outer edges of the foothills. The rocks are light gray or yellow sandstones weathering brown, thickly bedded and cross bedded with light blue gray or olive sandy shales, holding intercalations of hard lamellar sandstones, and rarely lenses of blue concentric weathering limestones. The whole series is characterized by the presence of land and fresh-water shells, and a flora of Fort Union type.

Mr. Tyrrell says the Rocky mountain uplift began after the deposition of the Edmonton Laramie, the plains gradually sinking beneath the level of the fresh-water lake. The distinction between the Fort Union and the coal-bearing Laramie has been strongly insisted upon by Newberry, by whom the Fort Union with its wholly distinct flora was regarded as Eocene. That no unconformity has been recognized between the two in the region of the Great Plains is to be expected, but the collections of Prof. L. F. Ward from near Glendive, on the lower Yellowstone river, seem to show the absence of the Laramie as defined in this paper at that locality, the Fort Union resting directly upon Fox hill strata. The interpolation of the Livingston series and the great unconformity it shows, between the coal-bearing Laramie and the Fort Union, seems to be good and sufficient grounds for the adoption of Prof. Newberry's divisions, and places us in accord with the results of recent work in Colorado, so fully described by Cross and Hill in their recent publication.

POST-LARAMIE VOLCANIC ERUPTIONS.

The rocks described as parts of the Livingston formation all suggest the importance and extent of the volcanic activity that followed the coal-making period of the Laramie. The water-laid sediments and the terrestrial accumulations of breccias and agglomerate both clearly show the proximity of volcanic centers. These rocks have now been identified over parts of a large area of the Rocky mountain front in Montana and show that the eruptions were not merely local in character. At only one locality, observed by Dr. A. C. Peale, near the Jef-

feron river, have interbedded lava flows been observed. The deposits generally seem to indicate a period of volcanic outbursts, rather than profound intrusions or extensive outflows of later ages. This volcanic activity became the most important feature of Tertiary time in this region and profoundly modified the topography, which is today largely due to the breccias and lavas of that age. The importance of the Livingston rocks is apparent when it is considered that the volcanoes of that period were the ancestors of the great volcanoes of Tertiary time, and the definite establishment of the stratigraphical position of the earliest records of this activity is the foundation for the study of the order of succession of the volcanic rocks of the region and the geological history which they record.

It may be of interest in this connection to refer briefly to other occurrences of volcanic rocks in the Cretaceous. The presence of conglomerates formed of volcanic pebbles in what is here designated the Livingston series was noted by Lindgren while studying the relations of the coal beds to the older rocks for the Northern Transcontinental Survey.¹ In his later paper on eruptive rocks from Montana,² he states: "The character of the subaerial masses accompanying these eruptions is not well known; only a few conglomerates in the Laramie give some hint as to their nature. In the case of a volcanic conglomerate at the coal fields of Bozeman, the horizon could be determined to be 2,200 feet above strata in which fossils of the Fort Benton group were found. This conglomerate consists of pebbles of hornblende-andesite, to which consequently no later age than lower Laramie can be assigned."

In a conglomerate about 1,000 feet above Cretaceous No. 2, in the Highwood mountains, dacites and andesites were found by the same observer. Augite-andesite pebbles form a conglomerate exposed on Sixteen-mile creek, and considered by Lindgren to be Laramie.

In Canada Dr. Dawson has described the occurrence of volcanic agglomerates similar to those of Montana interbedded in a series of strata overlying the Kootanie coal seams, and referred to the Dakota. These agglomerates occur at a horizon about 3,350 feet above the Kootanie coal seams, and consist of "volcanic rocks chiefly, if not entirely, fragmental, forming an agglomerate of varying coarseness, frequently so fine as to be designated a volcanic ash." For the most part they are grayish green or purple, and toward the base weather easily, forming rounded crumbling masses. This description is equally applicable to the agglomerates of the Bozeman coal field. In the general geology of his report, Dr. Dawson alludes still further to the volcanic agglomerates: "The volcanic ash beds and agglomerates of the Cretaceous in this region are evidently due to a local eruption which had its center in the latitude of the Crow Nest pass. These volcanic rocks have, however, been traced north and south from this point over

¹ Tenth Census, vol. xv, p. 725.

² Proc. Cal. Acad. Sci., ser. 2, vol. III, p. 51.

a total length of 45 miles, and may probably have at one time had as great an extension east and west, though this has subsequently been diminished by the folding together of the beds. The volume of strata between the coal-bearing horizon and the base of the volcanic rock is estimated approximately at 3,350 feet in the Crow Nest pass, and 2,400 feet on South Kootanie pass. The volcanic rocks themselves are 2,200 feet thick at Crow Nest pass and thin rapidly to the north and south. Dakota plants are found a few hundred feet below these volcanic rocks."

SUMMARY.

The facts presented in this paper are believed to be an important contribution to our knowledge of the orographic and structural geology of the Rocky mountains. The post-Laramie movements that formed so important a part of the mountain building period in Colorado are herein shown to have this parallel in Montana and to accord with the observations made in Canada by Dawson and Tyrrell.

The facts which have been presented may be summarized as follows:

First. The coal-bearing Laramie terminated the succession of conformable cretaceous sediments.

Second. The beds overlying the Laramie Coal-measures give evidence in their pebbles of an unconformity with them and are distinguished by a remarkable change in their composition. To this series of beds the name Livingston formation is applied. It consists of sandstones, conglomerates, and shales, formed chiefly of andesitic volcanic material, with an admixture of Archean débris near the shore line. The beds show very little assorting by water action, the fragments are angular, and the lower part of the series is decidedly tufaceous, being frequently a fine volcanic agglomerate. These beds are consolidated, water-laid sediments formed of cinders, lapilli, and other ejectamenta of explosive volcanic eruptions. This material fell directly into the lake waters or was washed into them from the slopes of the volcano. The abundant plant remains of this formation are discussed at length in Prof. Knowlton's report.

Third. Volcanic agglomerates are intercalated in the Livingston formation. They are unmistakably subaerial deposits of coarse volcanic ejectamenta, compactly cemented by fine-grained ash and rudely bedded. They represent the material forming the flanks of a post-Laramie volcano, whose northern base was subsequently covered by the waters of a lake whose sediments form the rocks of the Crazy mountains.

The lower division of the Livingston beds is thinnest on the Boulder river, where the agglomerates are thickest, increases in thickness as the latter thins out, and attains a maximum development on the Missouri-Yellowstone divide, where the agglomerates are farthest away.

It is believed that the Livingston series and the volcanic agglomerates are the record of volcanic eruptions which began after the close

of the coal-making Laramie and were attended by an uplift of considerable extent. Erosion of the volcanic slopes supplied the rounded pebbles and sands, while ash showers formed the coarser tufaceous rocks. In the eastern part of the Bozeman coal field the quantity of ejected material being greatest as nearer the source, the shallow waters were soon filled and the formation of the agglomerates began. Such gradual shallowing and filling are clearly indicated in the beds beneath the agglomerates. An examination of thin sections of the rocks forming the lower part of the Mission creek formation shows them to be composed of the same andesitic material as the agglomerates.

The rocks of this formation generally rest directly upon the Laramie Coal-measures in apparent conformity. The direct unconformity of the Livingston beds observed at Sphinx mountain and the positive proof of a great unconformity and subsequent erosion afforded by the composition of the conglomerates of the series show that the epoch of the coal-forming Laramie was terminated by an uplift of considerable extent. The land area resulting from this elevation was exposed to erosion during a prolonged period, in which a thickness of 4,600 feet of Mesozoic beds was removed and the Paleozoic limestones were exposed to denudation. The Livingston beds were deposited during this period of erosion. The lowest beds of the series in which no pebbles of sedimentary rocks have been detected may represent the area deposits following elevation. They certainly evidence a time of intense volcanic activity. The source of volcanic material is probably to be found in the volcanic outbursts of the Boulder river on the east and of the Flathead pass country to the north.

The recognition of the Fort Union formation above the Livingston is also believed to be an important discovery. This formation has long been a cause of controversy, and has by many been excluded from the Laramie. As its molluscan fauna is wholly fresh water, and, as such, is of little value in determining its age, the fossil flora has been relied upon for its discrimination, and this is clearly Eocene. The stratigraphic relations herein detailed seem to confirm this view.

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ANNOTATED LIST OF THE FOSSIL PLANTS OF THE BOZEMAN, MONTANA, COAL FIELD, WITH TABLE OF DISTRIBUTION AND DESCRIPTION OF NEW SPECIES.

By F. H. KNOWLTON.

The first collection of fossil plants from what is now very generally known as the Bozeman coal field was made in 1871¹ by the members of Dr. F. V. Hayden's party while they were encamped at Fort Ellis, preparatory to beginning their memorable exploration of the Yellowstone national park. The actual collecting was done by Dr. A. C. Peale, Mr. Joseph Savage, and Mr. W. H. Holmes. The specimens, as I am informed by Dr. Peale, were all obtained on the same day and from the same vicinity, although not all at exactly the same spot. As the country was at that time new and unsettled, the nearest fixed point was the military reservation of Fort Ellis, and the specimens were labeled by the various collectors as follows: "Six miles above Spring canyon (now known as Rocky canyon), near Fort Ellis, Montana"; "above Spring canyon, near Fort Ellis," and "near Fort Ellis, above coal." The fact that there were three kinds of labels lead Prof. Lesquereux, to whom the specimens were submitted for examination, to suppose that they came from quite different localities, but in his published account² he referred them to the same horizon. Most of these specimens are fortunately still preserved in the collections of the U. S. National Museum, and it is therefore possible to correlate them with considerable certainty with the recent collections made in the same region.

The specimens of this first collection may be very readily separated into two groups by the character of the matrix in which they are preserved. The first consists of a very hard, dark metamorphic shale, breaking across the plane of stratification, and therefore rarely affording perfect impressions. The other is a lighter colored, but very coarse, hard sandstone not well suited for the preservation of the details of nervation.

The exact spot from which the original specimens in dark metamorphic shale were obtained has been revisited by Dr. Peale and myself

¹ Hayden's Ann. Rept., 1871, p. 296.

² Hayden's Ann. Rept., 1872, p. 404.

and a considerable collection gathered, which contains nearly all of the species known, from a comparison of the types in the National Museum, to have come from there. It is the locality now known as Hodson's coal mine, and is on Meadow creek, about 12 miles southeast of Bozeman.

The precise point at which the specimens preserved in the coarse sandstone were obtained has not been rediscovered, as they were collected in 1871 by Messrs. Holmes and Savage, who have never revisited the place. There is, however, little reason to doubt but that it is the same horizon as that at which plants in exactly similar material have been obtained in recent years at the mouth of Bear canyon and near the mouth of Fir canyon. If this supposition be true, and there is no reason to suppose the contrary, as it can be traced continuously from the mouth of Bear canyon to the Meadow creek locality, this horizon is a little lower than the former or the one containing the dark cross-bedded shales.

Following is an enumeration of the material which has furnished the basis for the present paper, with a statement of localities and collectors:

The original collection of 1871, embracing forty specimens and twenty species preserved in the U. S. National Museum.

Timber line, Gallatin county, Montana. Collected by Dr. A. C. Peale, August 30 and 31, 1883. A few nearly indeterminable fragments.

East side of Bridger range, 8 or 10 miles north of Bridger canyon, Gallatin county, Montana. Collected by Dr. A. C. Peale, August 9, 1885. Fragments determinable generically only.

East side of Bridger range, half mile north of Flathead pass, Gallatin county, Montana. Collected by Dr. A. C. Peale, August 28, 1885. Contains only three species.

Bear canyon, half mile above its mouth and 6 miles southeast of Bozeman, Gallatin county, Montana. Collected, August 25, 1886, by Dr. A. C. Peale. This is the coarse sandstone mentioned above and contains fragments of five or six species.

Near head of Fir canyon (north side), 8 miles east of Bozeman, Gallatin county, Montana. Collected by Dr. A. C. Peale, July 23, 1887, and September 28, 1888. Embraces about a dozen species.

Stone quarry on the road to Meadow creek and about half mile above its mouth. Collected by Dr. A. C. Peale and F. H. Knowlton, September 27, 1888.

Hodson's coal mine on Meadow creek, 12 miles southeast of Bozeman, Gallatin county, Montana. Collected by Dr. A. C. Peale, August 16, 1888, and by Dr. Peale and F. H. Knowlton September 28, 1888.

Mouth of Fir canyon, east side of East Gallatin river, 4 miles southeast of Bozeman, Gallatin county, Montana. Collected by F. H. Knowlton, July 3, 1888.

Between middle and north branches of Bear creek, east of Madison valley, on the east side of the Madison range. Collected by Dr. A. C. Peale August 20, 1889. This is really extralimital, but is included because it is the only other lot of plants from this part of Montana, and is moreover in material similar to that from Hodson's coal mine, and also contains some of the same species.

Horr and Craig mines, Cinnabar mountain, Montana. Collected by W. H. Weed July 17 and 18, 1890.

Near Little Mission creek and east of Mission creek. Collected by W. H. Weed, August 22, 1890.

ANNOTATED LIST OF SPECIES.

ANEMIA SUBCRETACEA (Sap.) Ett. and Gard.

Gymnogramma Haydenii Lx.

Only two or three small fragments observed.

ASPIDIUM LAKESII (Lx.) Kn.

Plate II, figs. 1-4.

Lathræa arguta Lx. Hayden's Annual Report, 1869, p. 96.

Sphenopteris eocenica Ett. Eoc. Fl. d. Mont. Prom., p. 9, Pl. II, figs. 5-8; Hayden's Annual Report, 1872, p. 376.

Sphenopteris Lakesii Lx. Tert. Fl., p. 49, pl. II, figs. 1, 1a.

Sphenopteris membranacea Lx. Hayden's Annual Report, 1873, p. 394; Tert. Fl., p. 50, pl. II, figs. 2, 2a, 3, 3a.

Habitat.—Between middle and north branches of Bear creek, east of Madison valley, on the west side of the Madison range, Montana. Collected by Dr. A. C. Peale August 20, 1889.

As stated in the list of localities this material is not from the Bozeman coal field proper, but is included on account of the fact that it is the only other lot of plants from this part of Montana, and moreover possesses exceptional biological interest. It is undoubtedly of same age as the Hodson's coal mine material. The form to which these specimens are referred occurs in great abundance in the Denver beds of Colorado and may be regarded as one of the most characteristic species of that formation. The collections from Colorado contain hundreds of specimens, but strangely enough not one has been found in fruit, and it is therefore of great interest to find the fruiting specimens and be able to settle definitely its systematic position. In absence of the fruit it was referred to the genus *Sphenopteris* by Lesquereux, but the fortunate finding of these fragments in fruit, as shown in Figs. 1, 2, 3, of Pl. VI, makes necessary their reference to the genus *Aspidium*.

The complete description of this species in the light of all known material is reserved for a subsequent publication, but in order to show that the Montana specimens agree in matter of outline and nervation with those from Colorado, a single specimen is figured (Pl. VI, Fig. 4) from near the Douglas coal mine at Sedalia, Colo.

EQUISETUM (?)

A minute fragment of doubtful identity.

ABIETITES DUBIUS Lx.

Lesquereux, Tert. Fl., p. 81, Pl. VII, Fig. 24; *non* Figs. 20, 21, 21a.

The specimens upon which this species was founded are preserved in the U. S. National Museum. After a careful study of them, together with all material since obtained from the same region, I have divided the species as defined by Lesquereux, a part going to *Sequoia Reichenbachii* Gein. (q. v.), and the small, rather doubtful remaining ones are retained under *A. dubius*.¹

Abietites setiger Lx., described at the same time, is to be dropped. Schenck (Zittel's Handb. d. Pal., vol. II, p. 350) was the first to suggest that the fragment upon which this was founded was probably nothing but the roots of some plant, and an examination of the type specimens in the U. S. National Museum abundantly confirms this view.

SEQUOIA REICHENBACHI Gein.

Abietites dubius Lx., ex. p., Lesquereux, Tert. Fl., p. 81, pl. VI., figs. 20, 21, 21a.

Sequoia Reichenbachii is essentially a Cretaceous species and enjoys a very extensive vertical and areal distribution. It first appeared in the extreme upper Jurassic, is abundant in the Kootanie and Potomac formations and other lower and middle Cretaceous deposits, and is also found in the lower or true Laramie and the post-Laramie of Colorado and Montana.

The National Museum contains several specimens under this name from Spring canyon (Hodson's coal mine), although it does not appear in any of Lesquereux's publications, as found at this place. The recent collections also contain a number of fine specimens. They are distinguished from *Abietites dubius* Lx., by the smaller, more arched and very acute leaves, which were clearly sharply angled. I have referred here Figs. 20, 21, 21a, pl. VII, of Lesquereux's *Tertiary Flora*, there called *Abietites dubius*.

TAXODIUM DISTICHUM MIOCENUM Heer.

Heer, Mioc. Balt. Fl., p. 18, Pl. II; III, Figs. 6, 7; XIV, Figs. 24-28; XV, Fig. 1a; Flor. foss. arct., v, Pt. II, p. 33, Pl. VIII, Fig. 25b; IX, Fig. 1; Lesquereux, Tert. Fl., p. 73.

Taxodium dubium Heer. Lesquereux, Hayden's Annual Report, 1872, p. 389; 1873, p. 409.

Several specimens of this widely distributed species were found in the Hodson's coal mine material. One of them is a large, well preserved specimen, which makes the determination very satisfactory.

GINKGO ADIANTOIDES Ung.

Represented by several fine specimens.

¹ For full discussion of the conifers of the Bozeman coal field, see forthcoming Monograph on the Laramie and allied formations, in preparation.

THINNFELDIA POLYMORPHA (Lx.) Kn.

Plate I, Figs. 1-4.

Salisburia polymorpha Lx. Am. Jour. Sci., 2d ser., vol. XXVII, 1859, p. 362; Hayden's Ann. Rept., 1872, p. 404; Tert. Fl., p. 84, Pl. LX, Figs. 40, 41; Knowlton, Proc. Biol. Soc. Wash., Vol. VII, p. 153.

Leaves cuneiform or long wedge-shaped, narrowed from above the middle downward into a strong thick petiole and rounded, erose or irregularly lobed or cut at apex; margin entire or more frequently strongly irregularly undulate or toothed; mid-vein very strong, continuing to the apex or in some cases nearly or quite vanishing just below the point; veins thin, close, simple, emerging at an acute angle from the mid-vein, thence running with slight curve to the margin.

The leaves of this species are very large, measuring in some instances fully 30^{cm} in length and 9-11^{cm} in width. The smallest specimen (Fig. 4), which may not be complete, is 10^{cm} in length by 3^{cm} in width, but most of the specimens, of which there are numerous fragments, are fully as large as the maximum size given above. They were provided with a strong thick petiole, as in Fig. 3, at least 3^{cm} long and 3^{mm} in diameter. In outline the leaves are long wedge-shaped at base, and rounded or variously, irregularly lacerate-toothed at the apex, as seen in Figs. 1 and 2. The margin, perhaps best seen in Fig. 2, is irregularly undulate, or in some cases, as in Fig. 4, slightly toothed. The mid-vein or rib is very thick and prominent, sometimes running clear to the apex, as in Figs. 2 and 4, while in others it vanishes just below the apex, as in Fig. 1. The lateral veins emerge at a very acute angle and are close, fine and only slightly curved in running to the border.

The name of *Salisburia polymorpha* was first given by Lesquereux¹ to some fragmentary specimens collected by Dr. John Evans at Nanaimo, Vancouver island. It was not described in this publication, the only statement being that, besides several species of dicotyledons, there was also "a very fine *Salisburia*, very variable in the outline of its leaves and named *Salisburia polymorpha* (Lesq.), distinctly related to *Salisburia adiantoides* (Ung.), found in the Pliocene of Italy." Lesquereux's next mention of this species was in Hayden's Sixth Annual Report (1872), when he identified as belonging to it certain fragmentary specimens obtained by Dr. A. C. Peale and Mr. Joseph Savage from "six miles above Spring canyon, near Fort Ellis, Montana," which locality is the same as that now known as Hodson's coal mine. He alludes to the Vancouver specimens, and states that they had been "described and figured for a final report, which was delivered to Dr. Evans but was never published." This report still remains, so far as known, unpublished, and therefore the Vancouver specimens are still without description or fig-

¹Am. Jour. Sci., 1859, p. 362.

ures, existing only in name. The Spring canyon (or Hodson's coal mine) specimens were more fully described and illustrated, under the name of *Salisburia polymorpha*, by Prof. Lesquereux in his Tertiary Flora, where he states that he is not quite positive that they are actually the same as those from Vancouver, a view that, in the light of the present large series, is likely to prove correct. But in absence of either descriptions, drawings or specimens from Nanaimo, it is manifest, that according to the laws of nomenclature, the name must be permanently associated with the specimens first actually described, and it therefore falls to the Montana specimens. If subsequent investigation shows that the Nanaimo specimens are actually the same as those from Montana, they will of course take this name, but if they represent a good species of *Salisburia* (or *Ginkgo*) allied to *S. adiantoides*, as Lesquereux has said, they must receive a new name.

Some of the forms of this species seem at first sight strongly to resemble certain forms of *Ginkgo*, as Fig. 4, and in absence of a series for study Prof. Lesquereux was undoubtedly justified in supposing them to represent leaves of this genus. But when a considerable number of specimens are examined it is seen that they do not agree closely with *Ginkgo*, although it is possible that they are in some way connected with it. Four leaves of *Ginkgo* that have been identified as *G. adiantoides*, are found in beds of nearly the same horizon, but not actually associated in the same place. As these leaves can not be received in *Ginkgo*, I have thought best to place them under the somewhat miscellaneous genus of *Thinnfeldia*, which, according to recent views, seems best characterized to contain them. The genus *Thinnfeldia* should be placed according to the latest authorities among the conifers, a view which the present specimens undoubtedly confirm, but it has been shifted about from place to place. Thus Schenk at one time regarded it as belonging to the Cycadaceæ; while Saporta, Schimper, and at first Nathorst, would place it among the ferns, a position which some of the forms included under it would undoubtedly demand, for there are, judging from the published drawings, some true ferns. On the other hand, Ettingshausen and Nathorst, in his later views, would put this genus among the conifers, the former writer supposing it to be allied to the genus *Phyllocladus*.

The species under consideration is found in company with and is undoubtedly related to the following species, which in turn, is very closely related to *T. Lesquereuxiana* of Heer from the Atane beds of Greenland. Heer identified with his species Lesquereux's *Phyllocladus subintegrifolius* from the Dakota group of Kansas and placed it, under the heading *Incertæ sedis*, after the ferns. Whatever may be the disposition of the various species of *Thinnfeldia*, for this genus seems to be in need of revision, I am convinced that the Montana specimens under consideration belong to the conifers and are not far removed from the genus *Phyllocladus*.

Certain of the smaller fossil leaves, as Fig. 4, have a strong resemblance to certain living species of *Phyllocladus*, as for example *P. rhomboideus* Rich., from Tasmania, which is irregularly toothed or lobed on the margin but is larger and more regularly wedge-shaped at apex. The rachis is much the same in both. It is possible that it may be connected with other living species of *Phyllocladus*, but the limited herbarium at my command will not admit of further comparisons.

THINNFELDIA LANCEOLATA n. sp.

PLATE V, Fig. 5.

Leaves long-lanceolate, tapering gradually below into a thick petiole and above into a long, slender acuminate apex; margin entire or slightly undulate-crenate, especially above the middle; mid-vein very strong in the lower portion, gradually becoming thinner above and vanishing below the apex; veins numerous, close, simple or rarely forked; at an acute angle of divergence, running straight to the margin.

This species is well represented by the very perfect specimen figured (Pl. v, Fig. 5), as well as by several smaller less perfect fragments. It has a length of 31^{cm} and a width in the middle of 4^{cm}. The midrib at the base is very strong and thick and was evidently extended into a thick petiole, which is now broken. Another specimen of exactly the same shape is only about 25^{cm} long and 3^{cm} wide, but has neither the apex or base preserved. The midrib is very pronounced in the lower half of the leaf, but becomes gradually thinner until it vanishes in the upper fifth of the leaf. The nerves emerge from the midrib at a very acute angle. They are close, parallel and rarely, possibly never, forked.

This species is found associated in the same beds, and even on the same pieces of matrix, with the preceding, and is evidently closely related to it. The thick, prominent midrib and the numerous close veins emerging at an acute angle from it, are the same in both species, but the present species is readily distinguishable by its lanceolate form, with nearly entire margins and long acuminate apex. It is possible that they may represent leaves from different parts of the same tree, or of the same species under different circumstances, for as is well known, many living trees exhibit such striking differences in form and size of foliage as almost to preclude the probability of their belonging to the same species. But as both forms can be so readily separated by the characters pointed out above, and particularly as no intermediate forms have been detected, it is thought best, provisionally at least, to describe them as distinct.

The only described species of *Thinnfeldia* with which this form seems to be related is *T. Lesquereuxiana* Heer (Fl. foss. arct., VI, Abth. 2, p. 37, Pl. XLIV, Figs. 9, 10; XLVI, Figs. 1-12), with which Heer has also identified the *Phyllocladus subintegrifolius* of Lesquereux (Cret. Flora, p. 54, Pl. I, Fig. 12). It, however, differs by its much larger size and in

being always pointed at apex and quite entire. It is not improbable, however, that they may be more closely related than the present specimens permit of deciding.

There are several living conifers with which this species is undoubtedly related, and were it not for the fact that it seems to be related to the preceding form (*T. polymorpha*), it might perhaps best be described under the name of the living genus. This living genus is *Podocarpus*, of the tribe *Podocarpeæ*. The species which it most resembles is *P. macrophylla* Wall., from tropical India, which has lanceolate leaves 6 to 8 inches in length and a little more than one-half inch in width, and of exactly the same shape as the fossil leaves. It has also a strong mid-vein with close, divergent, lateral veins, as in the fossil. *P. Rumphii*, from New Guinea, is also quite like the fossil species, as is *P. leptostachya* Bl., from Borneo, and *P. salicifolia*, from the island of St. Martha.

PHRAGMITES ALASKANA Heer.

The specimen referred by Lesquereux to this species is in the U. S. National Museum collection, and the newly obtained material agrees exactly with it.

CAULINITES SPARGANIOIDES Lx.

The fragments which Lesquereux had from this place were referred with considerable doubt to this species. The specimens in the latter collections are similar to those seen by Lesquereux, but the question as to whether they or any of them really represent the species under consideration is unsettled.

POPULUS MUTABILIS, var. ovalis Heer.

Not observed in the recent collections.

POPULUS LÆVIGATA Lx.

Only a single specimen, which is of the same character as that figured by Lesquereux from Rock creek, Laramie plains, being, however, much smaller.

POPULUS cf. ARCTICA Heer.

Plate II, Figs. 7-9.

Leaves broadly reniform with rounded lobes, a heart-shaped or slightly wedge-shaped base and very rounded apex; 5-nerved from the apex of the petiole, the nerves all of the same strength.

Habitat.—Near mouth of Bear canyon, 6 miles southeast of Bozeman, Montana. Dr. A. C. Peale, collector.

As will be seen from the figures the three leaves here referred provisionally to this species differ considerably among themselves, and there may possibly be two species, although probably not. Two of them

(Figs. 8, 9, of Pl. VI) are clearly similar. They have a very rounded outline, with a distinctly heart-shaped base. The five nerves, which are of nearly equal strength, all, or usually, arise from the apex of the petiole and do not arch much in passing to the borders. The other leaf (Fig. 7) has the same rounded outline, being as broad as or broader than long, but is wedge-shaped at base. The nerves are five in number, as in the others, and they diverge from the apex of the petiole in the same manner, but as the leaf is narrower the nerves have a more acute angle. In all the leaves it is a noticeable fact that the five nerves divide the leaf into approximately six equal parts, thus making a wider angle in the broad leaves than in the wedge-shaped one. The branching of the nerves, as far as it is possible to make it out, is the same in all. The further fact that they all occur at the same place and even on the same piece of matrix is suggestive of their belonging to the same species.

The question of their identity with *P. arctica* Heer is quite another thing. They can hardly be regarded as typical *P. arctica*, and yet they do not differ greatly from a few that have been figured as belonging to this species. Heer, Fl. foss. arct., Vol. I. Pl. V, Figs. 3, 4; Pl. XXI, Fig. 14; *op. cit.*, Vol. III. Mioc. Pfl. v. Grönl., Pl. II, Fig. 20a; *op. cit.*, vol. IV, Beiträge z. foss. Fl. Spitzb., Pl. XXXII, Fig. 3; Lesquereux, Tertiary Flora, Pl. XXIII, Figs. 1, 4, etc., while not absolutely similar, are very suggestive. In absence of sufficient material to make out a fuller description it has been thought best to leave them as above.

POPULUS? PROBLEMATICA n. sp.

Plate VI, Figs. 5, 6.

Fruiting ament long peduncled, the peduncle rather thick; capsules oblong, rounded at apex, pediceled.

Habitat.—Head of Fir canyon (north side) 8 miles east of Bozeman, Montana. Dr. A. C. Peale, collector.

The best preserved specimen (Pl. VI, Fig. 5), appears to have had a shorter peduncle than the other (Fig. 6), but it is partly obscured by the matrix and its full length can not be ascertained. The capsules at the base of this ament are long pediceled, but the pedicels become gradually shorter toward the apex of the ament and the capsules also become smaller. The other specimen (Fig. 6) is very obscure and the figure of it is in a measure conventional. It has a long, naked basal portion, and the capsules, if they be such, are more closely oppressed to the axis than in the best preserved specimen. It appears to have been in a younger state than the other at the time of its fossilization. It is also possible that it (Fig. 6) is not the same species as the other, for as remarked above, it is so obscure that it is made out with great difficulty.

It is with a good deal of hesitation that these aments are described under the name of *Populus*. As they occur at the same place, and one

of them actually on the same stone with specimens of *Thinnfeldia polymorpha*, the first thought is that they represent fruiting aments of this species, a view further supported by the fact that no leaves of *Populus* have been detected in this bed. A careful consideration, however, fails to develop other than negative support for this theory, for the aments that have been described for similar forms differ widely. Thus the aments described as belonging to *Ginkgo* in the various volumes of Heer's *Arctic Flora* are entirely different. The nearest approach to it is *Czekanowskia setacea* Heer,¹ which has pediceled fruits not unlike Fig. 5. But the leaves of this genus, which have sometimes been found attached to branches bearing the fruits, are entirely different from anything that has ever been found in the Bozeman coal field. There is, therefore, very little reason for supposing that these aments belong to this genus.

On the other hand, these aments have a decided resemblance to the mature fruiting aments of certain living species of *Populus*. They are for example very like *Populus monolifera* Ait., and more particularly *P. Fremonti*, Wats., var. *Wislizeni* Wats., from the state of Chihuahua, Mexico, as preserved in the herbarium of the U. S. National Museum. The living species mentioned have long aments with the large capsules pediceled as in the fossil and they decrease in size from above downward in the same manner.

While no leaves of *Populus* have so far been obtained in the same beds with these aments, no less than three well-marked species have been found in other parts of the Bozeman coal field, thus showing that this genus was undoubtedly present. It is, however, open to question, and it is to be understood as a merely provisional name awaiting the possible discovery of new and more decisive material.

SALIX ANGUSTA Al. Br.

The recent collections contain a great number of leaves or fragments of leaves which seem to be the same as those so identified by Lesquereux, but they are mostly without nervation and therefore in doubt.

QUERCUS CHLOROPHYLLA Ung.

The specimens referred by Lesquereux are in the Museum collection and are found to have come from the coarse sandstone layer. They are very obscure with very little nervation. The specimens in the recent collection are also in the coarse sandstone and are equally obscure.

They are, however, the same as those referred by Lesquereux to this species.

QUERCUS CASTANOPSIS Newberry.

This determination is based on a single fairly well-preserved leaf, and can not therefore be regarded as of much value.

¹ Fl. foss. arct., VI, Nachträge z. Jura Fl. Sibiriens p. 18, Pl. VI, Fig. 15.

QUERCUS GODETI? Heer.

The specimens referred by Lesquereux to this species are in the Museum collection, while the later collections do not contain it.

QUERCUS ? FRAXINIFOLIA Lx.

No additional specimens of this species have been seen.

QUERCUS ELLISIANA Lx.

The most abundant species of oak found in the collections.

Quercus Pealei Lx., was founded upon a single leaf from Spring canyon. This specimen is fortunately preserved in the U. S. National Museum, and after some consideration I have decided to reduce it to *Q. Ellisiana*. Lesquereux in his last mention of *Q. Pealei* (Tert. Fl., p. 156) said: "This small leaf * * * may be referable to the former species." It comes from the same beds, and is the only one ever obtained. At first sight the nervation may appear quite unlike the typical *Q. Ellisiana*, but by comparing all the figures and recent specimens it is found that the position and direction of the lowest pair of secondaries depend upon the shape of the leaf, and the narrower examples of *Q. Ellisiana* have the same character.

JUGLANS RUGOSA Lx.

A number of good specimens obtained.

JUGLANS DENTICULATA Heer.

No specimens observed in the recent collections, and none of those referred to this species by Lesquereux are in the Museum collection.

JUGLANS RHAMNOIDES Lx.

The specimens referred to this species by Lesquereux are also missing, and none that could be regarded as similar have since been found.

PLATANUS GUILLELMÆ Göpp.

A number of well preserved leaves were found which seem clearly to belong to this species. They are evidently closely allied to the following species, as pointed out by Lesquereux,¹ and have usually been found associated with it. They probably represent a single variable species.

PLATANUS ACEROIDES Göpp.

None of the recent material contains specimens that seem to belong to this form, and its presence is based on Lesquereux's determination

¹ Tert. Fl., p. 183, et seq.

and upon a single broken specimen in the Museum collection under the name *Quercus platanoides*, now regarded as a synonym of *P. aceroides*.

FICUS AURICULATA Lx.

The recent collections contain nothing but a number of fragments that are doubtfully referred to this species, while the type specimens are missing.

FICUS TILIÆFOLIA Al. Br.

This species enjoys precisely the same status as the former.

FICUS PLANICOSTATA Lx.

The recent collections embrace a number of well preserved leaves that are referred with much certainty to this species.

CINNAMOMUM SCHEUCHZERI ? Heer.

The specimens in the collection of 1872 were doubtfully referred by Lesquereux to this species. They are preserved in the Museum collection and agree exactly with a number in the late collections. They are, however, not sufficient to settle the real question of their identity.

CINNAMOMUM ELLIPTICUM n. sp.

Cinnamomum polymorphum Al. Br., Lesquereux, Tert. Fl., p. 221, pl. XXXVII, fig. 10 [non fig. 6].

Cinnamomum Rossmässleri Heer, Lesquereux, Hayden's Ann. Rept., 1872, p. 379.

Leaf of medium size (about 9^{cm} long and 4^{cm} broad), long-elliptical in outline, apparently rounded above to a short acumen (broken), and below to a rounded, slightly wedge-shaped base; lateral nerves thick, as prominent as the midrib, ascending to near the upper extremity, branching outside; midrib sparingly branched above the middle.

Habitat: Hodson's coal mine on Meadow creek, 12 miles southeast of Bozeman, Montana.

It is with some hesitation that this species is described as new to science. It depends upon a single well preserved leaf and a number of more or less doubtful fragments. This nearly perfect specimen was described by Lesquereux as *C. polymorphum*, Al. Br., and is the only specimen upon which the presence of this abundant European species in American strata rests. In the discussion regarding *C. polymorphum*, Lesquereux says: "In the leaves¹ which I refer to this species, the surface is coarser cut by deeper nervils, the midrib more divided than in *C. affine*.¹ But the essential characters of *C. polymorphum* are not sufficiently distinct upon our specimens, none of them having the upper part of the

¹The other one of the two so referred is now placed under *C. affine* Lx. F. H. K.

leaves or the acumen preserved, and the areolation and fibrillæ of the borders being obsolete. Therefore we may have in the two leaves referred here to *C. polymorphum* mere varieties of *C. affine*, and thus it may be that all the American *Cinnamomum* leaves represent only one species."

A careful comparison of the many published figures of *C. polymorphum* does not show any that agree satisfactorily with the one under discussion. It is for example much nearer to *C. Rossmässleri* Heer² with which Lesquereux appears at first to have identified it. It is also less like *C. affine* than he supposed it to be.

LITSEA WEEDIANA n. sp.

Tetranthera sessiliflora Lx. ex. p. Lesquereux, Tert. Fl. p. 217, pl. XXXV. fig. 9.

Leaf sessile?, entire, oblong-lanceolate in outline, broadest below the middle from which point it tapers upward gradually, then rather abruptly, into a sharp-pointed apex, and downward into a rounded heart-shaped base; midrib straight; secondaries about 6 or 7 pairs, subopposite, camptodrome, lowest pair emerging from just above the apex of the petiole at a more acute angle than the upper ones, joining the second pair just above the middle of the leaf; just below the first prominent pair of secondaries is a pair of thin veins that arch along near the lower margin of the leaf and unite with a branch of the first pair at about the middle of their length; cross nervation at right angles to the midrib.

Habitat: Hodson's coal mine on Meadow creek, 12 miles southeast of Bozeman, Montana.

The specimen of this species figured in the *Tert. Fl.* pl. XXXV, fig. 9, as *Tetranthera sessiliflora* was said by Lesquereux to have come from Evanston, Wyoming. Fortunately this specimen is still preserved in the U. S. National Museum collection (No. 305). A glance at the matrix shows conclusively that it could not have come from any known horizon at Evanston, and on referring to the Museum catalogue it is found properly recorded from "Spring canyon, Montana." The Museum contains another very perfect specimen (No. 834) of this species from the same place recorded under the name of *Cassia*, and the recent collection also affords another fine leaf, both of which agree perfectly with the one figured in the *Tert. Fl.*, loc. cit.

These leaves differ markedly from *Litsea* (*Tetranthera*) *sessiliflora* in being apparently sessile, in being broadest much below the middle, with a heart-shaped base and in having 6-7 pairs of secondaries with a single pair of thin veins below the lowest prominent pair. I have therefore regarded them as new to science and have named the species in honor of Mr. Walter H. Weed of the U. S. Geological Survey, who has done so much to unravel the intricate geology of this region.

¹ Fl. Tert. Helv. II, pl. XCIII, fig. 15.

LAURUS SOCIALIS Lx.

A number of fairly well preserved leaves are referred to this species.

FRAXINUS DENTICULATA HEER.

Several leaves with dentate margin are referred with considerable certainty to this form. It is, however, not well characterized.

ANDROMEDA GRAYANA HEER.

Probably the most abundant species from this locality.

ANDROMEDA AFFINIS Lx.

This species was first described by Lesquereux in Hayden's Annual Report, 1874, p. 348. It is there said to have come simply from "Spring canyon," without indication of the state or territory, and is included with the plants of the Dakota group. The type specimen is preserved in the U. S. National Museum where it was found among the specimens from Spring canyon, Montana, from which place it undoubtedly came as shown both by its original number and by the matrix in which it is preserved. In the Cretaceous and Tertiary Floras, p. 60, it is described among the Dakota group plants, an error which is also perpetuated in the final Flora of the Dakota Group, Monograph U. S. Geological Survey, xvii, p. 118.

NYSSA LANCEOLATA Lx.

The original specimens from Spring canyon that were referred by Lesquereux to this form are missing and none of the recent material contains it.

CORNUS RHAMNIFOLIA O. Web.

The specimens in the 1872 collection were preserved in the coarse sandstone and as they are very obscure they were with doubt referred to this species. The material from the mouth of the Bear canyon contains one or two leaves that have been referred here, although they are so obscure as to render their identification doubtful.

LEGUMINOSITES CASSIOIDES Lx.

A number of specimens are referred with certainty to this form as determined by Lesquereux's identification of the 1872 material.

CISSUS TRICUSPIDATA ? Lx.

Doubtfully referred to this species.

RHAMNUS RECTINERVIS Heer.

There are no specimens in the recent collections that can be referred to this form and the type specimens are also missing.

RHAMNUS SALICIFOLIUS ? Lx.

A number of fragments are doubtfully referred here.

CELASTRINITES LÆVIGATUS Lx.

The types of this species are preserved in the National Museum and are the only specimens ever found.

DOMBEYOPSIS PLATANOIDES Lx.

The types of this species are also to be found in the National Museum, and one or two fairly good additional specimens have been found.

NELUMBO.

A very obscure fragment doubtfully referred as above.

DISCUSSION OF TABLE.

Before passing to a consideration of the table it may be well enough to call attention to several points which would seem worthy of more consideration and weight than has usually been given them in many discussions of this kind, and in doing this I can hardly do better than quote from a recent paper by Prof. Fontaine.¹

¹Fossil plants from the Great Falls coal field, Montana. Proc. U. S. Nat. Mus. 1892, vol. xv, p. 489.

Table showing distribution of plants in the Bozeman coal field.

	Hodson's coal mine (Liv). ¹	Flathead pass (Liv).	Quarry, Chest-nuts (Liv).	Mission creek (Liv).	Head of Fir Canyon (L). ²	Mouth of Fir Canyon (L).	Mouth of Bear Canyon (L).	Craig & Hort mines (L).	Laramie (coal-bearing).	Denver.	Carbon and Evanston.	Fort Union.	Eocene (Alum bay, etc.).	Green River group.	Miocene.	Pliocene.	Remarks.
<i>Anemia subcretacea</i> (Sap.) Ett. & Gard.					x			x	x	x			x				
<i>Aspidium Lakesii</i> (Lx.) Kn									x	x							
<i>Equisetum</i> ?									x								
<i>Abietes dubius</i> Lx.	x			x	x			x	x								
<i>Sequoia Reichenbachii</i> Gein.			x						x								
<i>Taxodium</i> dist. miocenum Heer.	x										x	x		x	x	x	
<i>Ginkgo adiantoides</i> Ung.				x									x				
<i>Thinnfeldia polymorpha</i> (Lx.) Kn.					x												
<i>Thinnfeldia lanceolata</i> , n. sp.					x												
<i>Phragmites alaskana</i> Heer.	x	x										x					A true Laramie species.
<i>Caulinites sparganioides</i> Lx.			x						x		x						
<i>Populus mutabilis ovalis</i> Heer	x								x						x		
<i>Populus laevigata</i> Lx.	x								x								
<i>Populus</i> ? problematica, n. sp.					x												
<i>Populus</i> cf. arctica Heer.						x											
<i>Salix angusta</i> Al. Br.	x	x			x								x		x	x	Tertiary, mainly Miocene.
<i>Quercus chlorophylla</i> Ung.						x											
<i>Quercus castanopsis</i> Newb.	x											x					
<i>Quercus Godei</i> ? Heer.	x																
<i>Quercus</i> ? fraxinifolia Lx.						x											
<i>Quercus Ellisia</i> Lx.	x					x											
<i>Juglans rugosa</i> Lx.	x									x	x	x	x	x	x		Has a wide distribution.
<i>Juglans denticulata</i> Lx.	x									x	x						
<i>Juglans rhamnoides</i> Lx.	x									x	x						
<i>Platanus Guillelmæ</i> Göpp.	x				x		x			x	x						Miocene outside of United States; true Laramie in United States.

After discussing at some length the facies of the Great Falls flora Prof. Fontaine says: "In this connection I will repeat an opinion expressed before. In determining the age of an unknown group of fossil plants, greater weight, as evidence of age, ought to be assigned some plants than others. These are the plants whose fossils have marked and salient features, that permit them to be identified without danger of error. An example of this kind is *Frenelopsis*, especially *F. parceramosa* of the Potomac flora. Where these are fully established and at home in a formation, as would be shown by their general distribution and the abundance of fossil specimens that they afford, they ought not to be considered as units in a sum total to establish a percentage. Their evidence would thus be neutralized by that of other units which are newcomers or belated survivors. This is especially true of floras in a critical stage of evolution, and which contain a considerable number of newcomers and survivors. The Potomac flora was one of this character, in which Jurassic types were being cast out and Cretaceous ones introduced."

The Bozeman coal field presents a problem somewhat similar to that of the Great Falls coal field and remotely of the Potomac formation. That is, the fossil plants play an important role in confirming the results of stratigraphy. But as Fontaine has said we should not take absolute percentages but should take into account the species which may be identified with absolute or at least reasonable certainty, and also their relative abundance. Several European species were identified by Lesquereux with hesitation in this flora, such as *Quercus Godeti*, *Cinnamomum Scheuchzeri*, *Rhamnus salicifolius*, etc., and it would manifestly be not only unwise but probably absolutely wrong to attach much weight to the foreign distribution of species of so doubtful a status. Such determinations are especially hazardous when, as in the present instance, the specimens are fragmentary or preserved in a matrix which will not retain the essential nervation.

Again, it would seem well to use with caution evidence derived from a single specimen of a species, no matter how certain its identification might be. It may be a waning type or a newly introduced one. The force of this argument, however, is somewhat reduced by the fact that, unless the exploration of the beds has been very thorough, we can never be certain that the specimens seen are a fair and full representation of everything found at that place. There is always the possibility that the next blow of the hammer may have revealed an abundance of what is now considered rare or perhaps represented by a single specimen.

Lesquereux, in his original consideration of this flora, referred it to the lower lignite¹ or true Laramie. Prof. Ward, on the other hand, inclined to regard it as belonging to the Fort Union² beds, but he in-

¹ Hayden's Ann. Rept., 1872, p. 409.

² Synopsis of the Flora of the Laramie group, p. 441.

cluded with the Bozeman coal field the somewhat indefinite localities in or near the Yellowstone National park, known as Yellowstone lake, Elk creek, and Snake river, therefore attaching undue weight to species common to these places and the Fort Union beds. The specimens that Lesquereux examined from these localities are fortunately nearly all preserved in the National Museum, and from a study of the matrix in which they are preserved, together with the recollections of Dr. A. C. Peale, who either collected them personally or was with the parties when they were obtained, we are able to arrive at a pretty definite conclusion as to their position. Those from the "Snake river," or rather from the "Divide between Snake river and Yellowstone lake," were collected by Dr. Hayden's party in 1871, and are from strata resting directly upon the Fox hills, therefore probably true Laramie. This view is confirmed by the present members of the U. S. Geological Survey connected with the Yellowstone park division. This is the type locality for *Gymnogramma Haydenii* or *Anemia subcretacea*, as it is now called.

The specimens from the Yellowstone lake were obtained during the same season by Dr. Hayden himself, and come from the west side of the lake, probably not far from Stevenson's peak. The material is the brittle shales, characteristic of what is known as the Volcanic Tertiary of that region. *Equisetum limosum*? Linn., was identified from this place.

The specimens from Elk creek were obtained by Dr. Peale, who is able to locate the spot very definitely on the present map of the Yellowstone park. They came from the foot of low bluffs just above (N. W.) the trail to Pleasant valley. That is, they came from the base of Crescent hill, about one mile above Yancey's. Several specimens were obtained here, among them *Platanus nobilis* or *Aralia notata*, as it was called by Lesquereux, the species which Prof. Ward seems largely to have relied upon to establish their connection with the Fort Union beds.

Having disposed of the localities clearly confounded with the Bozeman coal field, we may turn to a consideration of the table of distribution. This table embraces 44 more or less satisfactory species, which composes the flora of these beds. Of this number 5 are regarded as new to science, and are, therefore, dismissed as having, in themselves, no diagnostic value or at most only negative value. Of the remaining, 11 species have so far never been found outside of these beds, thus leaving 28 species having a distribution, and upon which we must largely rely for comparison. Of these 28 species no less than 22 are confined to the Livingston beds, while only 2 are confined to the Laramie proper, and 4 are found in both Livingston and Laramie beds. With this distribution of species within the Bozeman coal field in mind, we may pass to a comparison with other floras.

Of the 28 species only 7 have been found in the Fort Union beds.

These are *Ginkgo adiantoides*, *Phragmites alaskana*, *Juglans rugosa*, *Platanus aceroides*, and *Taxodium distichum miocenum*, which are positively identified in the two horizons, and *Quercus castanopsis*, which depends upon a single broken leaf from Hodson's coal mine, and *Ficus tiliæfolia*, found only in fragments in both places. Of the first four species, *Ginkgo adiantoides* has a very wide distribution outside of the United States in the Miocene and Pliocene of Europe. *Juglans rugosa* was originally described¹ from Marshall's mine, near Denver, Colorado, and is also especially abundant in the Denver formations at Table mountain, Golden, Colorado. It has a wide distribution in the United States and has also been found in the English Eocene at Alum bay Isle of Wight.

Of the 22 species of the Livingston beds having a distribution outside of this area, we find that 4 species (*Populus lævigata*, *Juglans denticulata*, *Ficus auriculata* and *Nyssa lanceolata*) are confined exclusively to the Denver beds of Colorado; 3 species occur in the Denver and later formations; 3 species in Tertiary beds; 10 species in Denver and Laramie, and only 2 species (*Sequoia Reichenbachii* and *Rhamnus salicifolius*) in Laramie exclusively. That is, no less than 17 of the 22 species are found either exclusively in the Denver or have their greatest development in this formation.

Of the 4 species (*Abietites dubius*, *Salix angusta*, *Platanus Guillelmæ* and *Andromeda Grayana*) found in both Livingston beds and Bozeman-Laramie, *Abietites dubius* is of doubtful status, being questionable in the Bozeman-Laramie; *Salix angusta* is a common European Eocene and Miocene species and is not found in the Laramie outside of the Bozeman coal field; while the other two are clearly identified in both horizons.

The two species found in the Bozeman-Laramie exclusively are *Anemia subcretacea* and *Quercus chlorophylla*, the first depending on a few fragments and the second upon a single specimen.

As the localities of Carbon and Evanston, Wyoming, are still open to question as to their age, it has been thought best to keep up the distinction by placing them in a separate column. They were regarded by Lesquereux as belonging to his Upper Lignitic, and therefore possibly belong to what has since been differentiated as the Denver group, to which they have been referred in the above tabulation, although Dr. C. A. White² would probably regard them as true Laramie, as he considers the Arapahoe and Denver formations as contemporaneous with the upper part of the Laramie, *where it is complete*. A more thorough study of these localities in the light of present knowledge would undoubtedly be productive of important results.

The only group which it remains seriously to consider is the true Laramie or coal-bearing series of strata, the Lower Lignitic of Les-

¹Hayden's Ann. Rept., 1869, p. 96.

²Bull. U. S. Geol. Survey, No. 82, p. 150.

quereux as typified at Raton mountains, New Mexico, Point of Rocks, and Black buttes, Wyoming, etc. Of the 28 species taken as the basis of comparison in the Bozeman coal field 14 have been found in the Laramie proper. This, it is to be understood, is the absolute number, of which several, from one cause or another are doubtful; thus, excluding the 2 species found only in the Laramie of both areas, and at least 5 of the 10 species above pointed out as common to the Denver and Laramie, we have no more than 6 or 7 of the 28 species belonging, in numbers worthy of much consideration, to the Laramie.

From these considerations it appears, beyond question, that the flora of the Livingston formation finds its nearest relationship with the flora of the Denver beds of Colorado. This result appears to differ from the results obtained by a preliminary study of this flora as set forth in a short paper published in July, 1892, on the *Fossil Flora of the Bozeman Coal Field*.¹ In that paper it was stated that an equal number of species were common to the Bozeman flora, and the Denver and Laramie of other parts of the United States. This statement was based on the distribution of the Laramie plants as contained in the books, which were published before the Denver beds had been separated as a distinct series, and when it was consequently impossible to tell exactly where a species came from, when as at Golden, Colorado, both formations are present, and both plant-bearing. Since that time much labor has been expended on a thorough revision of the Laramie and allied floras, based upon most of the original material, together with extensive recent collections. The result of this has been to fix definitely the distribution of a large number of the species, the horizon of which were before loosely given or often wholly unknown. This modification of our knowledge of distribution had made possible the above corrections in the working out of the affinities of the Bozeman flora.

NOTE.—Since the foregoing paper was written Mr. W. H. Weed has submitted to me a small collection of fossil plants obtained by him at the foot of the Crazy mountains, on Big Timber creek, Park county, Montana. The collection numbers nine specimens which I have been able to identify as follows: A single specimen each of *Sequoia Langsdorfii* Heer, and *Populus genatrix* Newberry, and four specimens of *Ulmus speciosa*? Newberry, with fragments of a *Platanus* (possibly *P. nobilis*), a *Phragmites* and *Ulmus* sp.

Sequoia Langsdorfii has been abundantly found in, but is not confined to, the Fort Union group, while *Populus genatrix* and *Ulmus speciosa* are typical Fort Union plants. While it is manifestly unsafe to place much dependence in such meager data all the species identifiable belong to or are found in the Fort Union group.

¹Proc. Biol. Soc., Wash., vol. VII. pp. 153, 154.

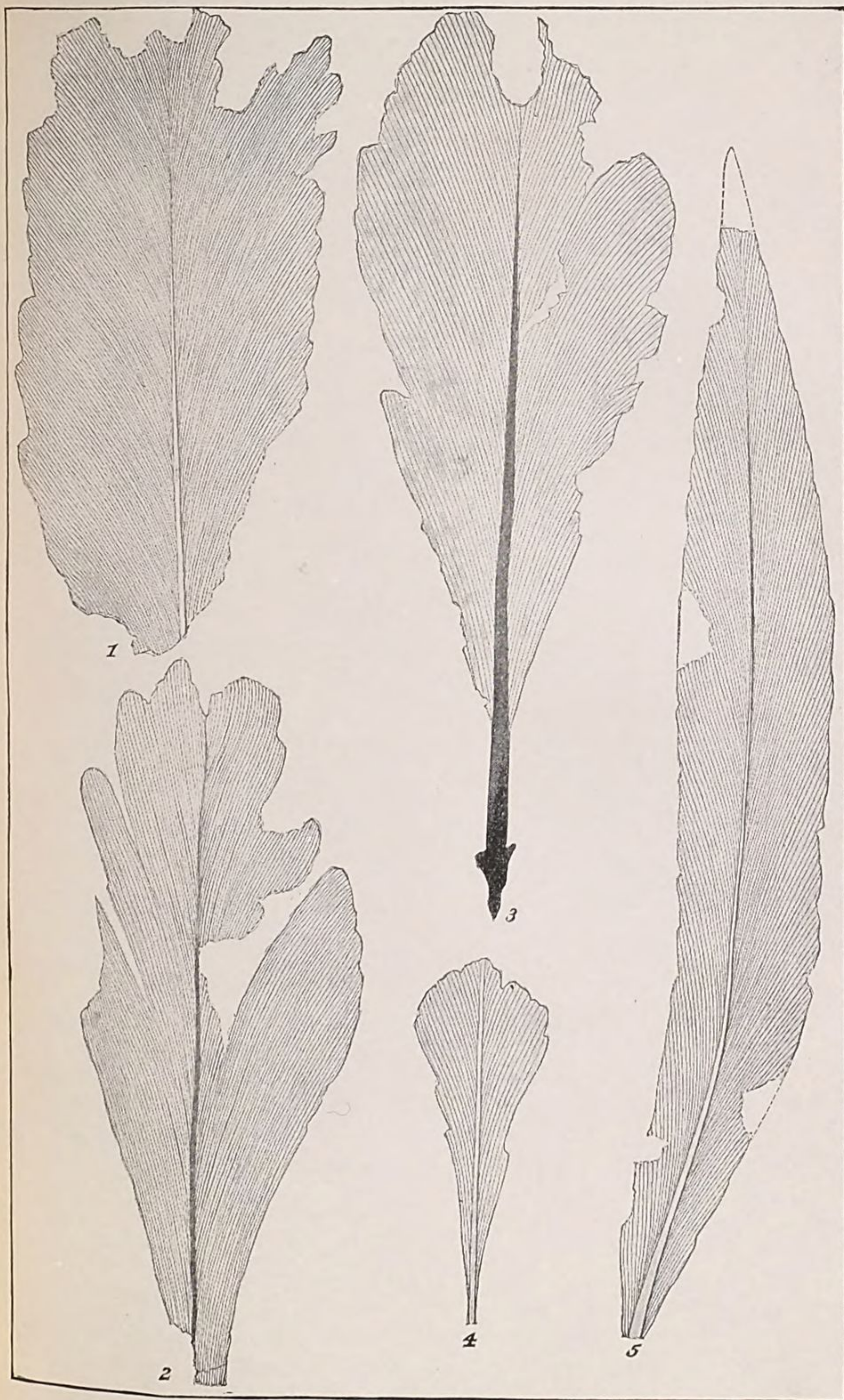
PLATE V.

FIGS. 1-4. *Thinnfeldia polymorpha* (Lx.) Kn.

From head of Fir canyon, 8 miles east of Bozeman, Montana.

FIG. 5. *Thinnfeldia lanceolata* n. sp.

From head of Fir canyon, 8 miles east of Bozeman, Montana.



FOSSIL PLANTS FROM THE LARAMIE AND OVERLYING LIVINGSTON FORMATION OF MONTANA.

PLATE VI

FIGURE 1. (Top view) of the specimen showing the arrangement of the teeth and the shape of the body. The specimen is a small, elongated, and slightly curved object, possibly a fossil or a mineral specimen. The teeth are arranged in a row along one edge, and the body is relatively uniform in width. The overall shape is somewhat similar to a small, curved blade or a piece of wood.

PLATE VI.

FIGS. 1-3. *Aspidium Lakesii* (Lx.) Kn.

From point between Middle and North branches of Bear creek, east of Madison valley, Montana.

FIG. 4. *Aspidium Lakesii* (Lx.) Kn.

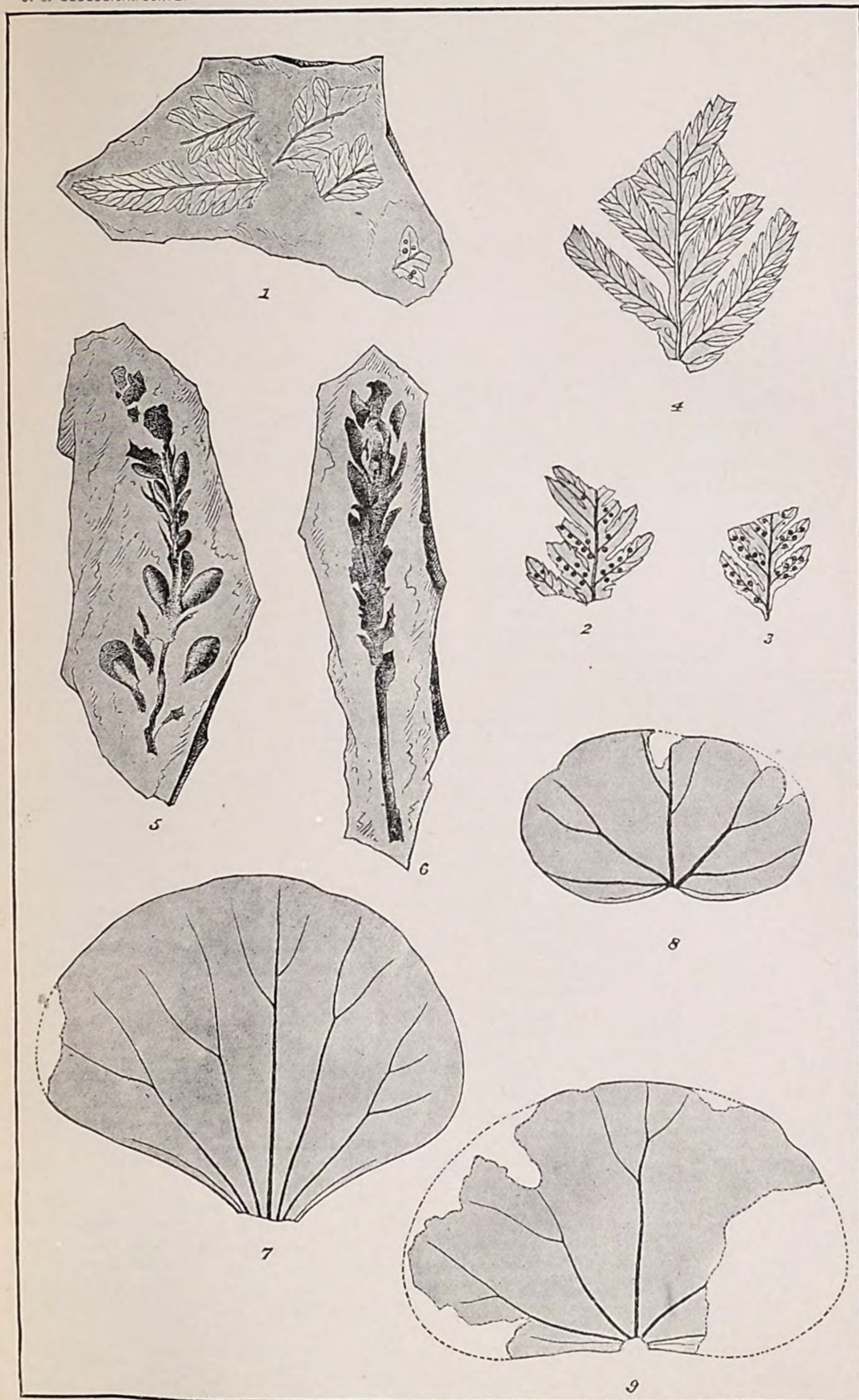
From Quarry No. 2, 3,000 feet east of the Douglas coal mine, Sedalia, Colorado. (Introduced for comparison.)

FIGS. 5, 6. *Populus ? problematica* n. sp.

From head of Fir canyon, 8 miles east of Bozeman, Montana.

FIGS. 7-9. *Populus cf. arctica* Heer.

From near mouth of Bear canyon, 6 miles southeast of Bozeman, Montana.



FOSSIL PLANTS FROM THE LARAMIE AND OVERLYING LIVINGSTON FORMATION OF MONTANA.

INDEX.

	Page.		Page.
<i>Abietites dubius</i>	46, 62	Hunter's Hot Springs, section at.....	29
<i>Andromeda affinis</i>	56	Iddings, J. P., cited.....	24
<i>Grayana</i>	56, 62	<i>Juglans denticulata</i>	53, 62
<i>Anemia subcretacea</i>	45, 61, 62	<i>rhamnoides</i>	53
<i>Aralia notata</i> (= <i>Platanus nobilis</i>).....	61	<i>rugosa</i>	53, 62
<i>Aspidium Lakesii</i>	45	Jurassic limestones and shales, fossils in..	16-17
Blue rim, section at.....	23	Laramie coal-making period, geological	
Bower's mine, section of coal-measures at ..	20	events following.....	11-12
Bozeman coal field, location of.....	13, 19	Laramie formation.....	18-21
fossil plants of	43-66	rocks of.....	19
Canadian nomenclature.....	37-38	delimitation of.....	19
<i>Caulinites sparganioides</i>	50	definition of.....	19
<i>Celastrinites lævigatus</i>	57	thickness of.....	19
<i>Cinnamomum ellipticum</i>	54	typical section of.....	20
<i>Scheuchzeri</i>	54	lithological characters of.....	20
<i>Cissus tricuspidata</i>	56	fossils of	20-21
Coals of the Laramie.....	19	unconformity with Livingston.....	34-35, 41
Cokedale, Montana, section exposed near.....	15-16	volcanic eruptions succeeding age of....	38-40
Colorado group, place of.....	17-18	<i>Laurus socialis</i>	56
<i>Cornus rhamnifolia</i>	56	Leaf beds of the Livingston formation.....	22-26
Crazy mountain beds, place of	11	Leaf remains in the Laramie.....	20
Cross, Whitman, cited	11	<i>Leguminosites cassioides</i>	56
Dakota horizon.....	17	Lesquereux, L., cited on plants of Bozeman	
gasteropod shells of	17	coal field	43, 60
<i>Dambreyopsis platanoides</i>	57	Lindgren, W., cited.....	39
Davis, W. M., fossils obtained by.....	17-18	<i>Litsea Weediana</i>	55
Dawson, D., cited	37, 39	Livingston, Montana, section near	15
Eldridge, G. H., geological section given by.	16	conglomerates.....	30-31
Emmons, S. F., cited.....	12	formation, place of.....	11, 21-35
<i>Equisetum</i>	45	name proposed	21
<i>limosum</i>	61	general divisions of	21-22
<i>Fecus auriculata</i>	54, 62	leaf beds of.....	22-26
<i>planicosta</i>	54	volcanic agglomerates of.....	21-22
<i>tiliaefolia</i>	54, 62	conglomerates of.....	21, 30-31
Fontaine, W. M., cited.....	60	leaf beds of.....	22-26
Fort Union formation	35-36	section of	23
Fossils, Jurassic	16-17	volcanic beds of.....	26-30
marine Cretaceous, occurrence of, in the		materials composing	32-33
Laramie.....	19	fossil remains of	33-34, 36-37
Laramie.....	21	unconformity with Laramie	34-35, 41
Fossil plants, Bozeman coal field.....	43-66	age of	36
table	58-59	Montana group	18
<i>Fraxinus denticulata</i>	56	<i>Nelumbo</i>	57
Gasteropod shells.....	17	<i>Nyssa lanceolata</i>	56, 62
<i>Gingko adiantoides</i>	46, 62	Peale, A. C., cited on geology of southern	
<i>Gymnogramma Haydenii</i> (= <i>Anemia sub-</i>		Montana	14
<i>cretacea</i>), type locality of.....	61	cited on volcanic beds of the Livingston	
Hills, R. C., cited.....	12	formation	26

	Page.		Page.
<i>Phragmites alaskana</i>	50, 62	<i>Sequoia Reichenbachii</i>	46, 62
Plants, Livingston formation.....	22-26	<i>Langsdorffii</i>	63
fossil, table	58-59	Stanton, T. W., cited	17
<i>Platanus aceroides</i>	53, 62	<i>Taxodium distichum miocenum</i>	46, 62
<i>Guillelmæ</i>	53, 62	<i>Thinnfeldia lanceolata</i>	49-50
<i>nobilis</i>	61	<i>polymorpha</i>	47-48
<i>genatrix</i>	63	Tyrrell, Mr., cited.....	37, 38
<i>lævigata</i>	50, 62	<i>Ulmus speciosa</i>	63
<i>mutabilis</i>	50	Unio remains in the Laramie.....	21
? <i>problematica</i>	51	Volcanic accumulations in region about	
<i>cf. arctica</i>	50	Yellowstone park	12
<i>Quercus castanopsis</i>	52, 62	Volcanic agglomerates of the Livingston	
<i>chlorophilla</i>	52, 62	formation	26-30
<i>Ellisiana</i>	53	Ward, L. F., cited on geological place of flora	
<i>fraxinifolia</i>	53	of Bozeman coal field.....	60-61
<i>godeti</i> ?	53	White, C. A., cited.....	17, 62
<i>Rhamnus rectinervis</i>	57	Whitfield, R. P., fossil species identified by.	18
<i>salicifolius</i>	57, 62	Wolff, J. E., cited on geology of the Crazy	
<i>Salix angusta</i>	52, 62	mountains	1

C

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COLORADO FORMATION

AND ITS

INVERTEBRATE FAUNA

BY

TIMOTHY W. STANTON



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CONTENTS.

	Page.
Letter of transmittal	9
Preface	11
Introduction	13
History and definition of the Colorado formation	13
Geologic description	20
The eastern border	20
The Upper Missouri region	23
Colorado and New Mexico	25
Utah	34
The relations of the Colorado fauna to other Cretaceous faunas	47
Description of species	52
Echinodermata	52
Vermes	53
Mollusca	54
Pelecypoda	54
Gastropoda	127
Cephalopoda	163
Arthropoda	189
Crustacea	189
Plates	191
Index	283

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1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
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62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

ILLUSTRATIONS.

	Page.
PLATE I. Serpulidæ and Ostreidæ	194
II. Ostreidæ	196
III. Ostreidæ	198
IV. Ostreidæ	200
V. Ostreidæ	202
VI. Ostreidæ	204
VII. Ostreidæ	206
VIII. Ostreidæ and Anomiidæ	208
IX. Spondylidæ, Limidæ, Pectinidæ, Aviculidæ	210
X. Aviculidæ	212
XI. Aviculidæ	214
XII. Aviculidæ	216
XIII. Aviculidæ	218
XIV. Aviculidæ	220
XV. Aviculidæ	222
XVI. Aviculidæ	224
XVII. Aviculidæ	226
XVIII. Aviculidæ	228
XIX. Mytilidæ, Pinnidæ, Arcidæ	230
XX. Pinnidæ, Arcidæ	232
XXI. Arcidæ, Nuculidæ, Solemyidæ, Crassatellidæ	234
XXII. Unionidæ, Lucinidæ, Cardiidæ, Cyrenidæ	236
XXIII. Cyrenidæ, Cyprinidæ	238
XXIV. Veneridæ	240
XXV. Donacidæ, Tellinidæ, Solenidæ	242
XXVI. Pholadomyidæ, Anatinidæ	244
XXVII. Mactridæ, Myidæ, Pholadidæ	246
XXVIII. Neritidæ, Turritellidæ	248
XXIX. Turritellidæ, Xenophoridæ, Naticidæ	250
XXX. Naticidæ, Pyramidellidæ, Rissoidæ	252
XXXI. Aporrhaidæ, Strombidæ, Tritonidæ, Fusidæ	254
XXXII. Fusidæ	256
XXXIII. Cancellariidæ, Volutidæ	258
XXXIV. Volutidæ, Pleurotomidæ, Actæonidæ, Bullidæ	260
XXXV. Nautiloidea, Ammonoidea	262
XXXVI. Ammonoidea	264
XXXVII. Ammonoidea	266
XXXVIII. Ammonoidea	268
XXXIX. Ammonoidea	270
XL. Ammonoidea	272
XLI. Ammonoidea	274
XLII. Ammonoidea	276
XLIII. Ammonoidea	278
XLIV. Ammonoidea	280
XLV. Ammonoidea	282

LETTER OF TRANSMITTAL

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,
DIVISION OF MESOZOIC INVERTEBRATES,
Washington, D. C., July 30, 1892.

SIR: I have the honor to transmit herewith a memoir by Mr. T. W. Stanton on the Colorado Formation and its Invertebrate Fauna, prepared for publication as a bulletin. The work was begun by him at my suggestion, and I have, as chief of the division with which he is connected, been constantly cognizant of its progress.

Very respectfully,

C. A. WHITE,
Geologist in Charge.

Hon. J. W. POWELL,
Director of the U. S. Geological Survey.

LETTER OF 1848-1849

TO THE HONORABLE THE SECRETARY OF THE

NAVY DEPARTMENT, WASHINGTON

DEAR SIR,

I have the honor to acknowledge the receipt of your letter of the 11th inst.

in relation to the proposed purchase of the schooner "Albatross" for the service of the Navy. I have the honor to inform you that the same has been referred to the proper authorities for their consideration.

I am, Sir, very respectfully,
Your obedient servant,

J. A. Smith
Secretary of the Navy

JOHN A. SMITH

Secretary of the Navy

PREFACE.

The following review of one of the Upper Cretaceous faunas as developed in the interior region of the United States has grown out of the study of a collection of fossils found by me in Huerfano park and adjacent localities in southern Colorado. This collection, the greater part of which was obtained during the summer of 1890, proved to be especially interesting because it afforded data for the closer correlation of certain Cretaceous strata in Utah with those east of the mountains, besides adding a considerable number of new species to the fauna of the Colorado formation. Dr. C. A. White, under whose direction the field work was done, generously assigned these fossils to me for study with a view to publishing the results, and I am greatly indebted to his sympathetic aid in every phase of the work.

The stratigraphic position of the Huerfano park fossils had been fully established in the field to be beneath the Niobrara division of the Colorado formation. In making the preliminary comparisons of species it soon became evident that the fauna of this horizon was much richer than had been supposed. Only about twenty-five or thirty species of invertebrates had been definitely assigned to the strata that are now included in the Colorado formation. Many had been described simply as Cretaceous without assignment to more definite horizons and a considerable number of other species had been erroneously referred to the overlying Montana formation. It therefore became necessary to study as far as practicable the vertical range and the faunal associates of these doubtful species, especially those reported from Utah and New Mexico, making use of the collections of the U. S. National Museum and of the Geological Survey, as well as the published reports and my own observations in the field. This investigation added a large number of species to the fauna of the Colorado formation and showed the desirability of bringing together in one publication the scattered descriptions and illustrations of all the species that can now be assigned to the fauna. While making this compilation the nomenclature and descriptions of the species have been revised in all cases in which better collections or other additional facts seemed to make it necessary. Thirty-nine species are described that are believed to be new to science.

The purely paleontologic portion of the work is supplemented by a

geologic introduction in which the Colorado formation is defined, many local sections are described, and faunal lists are given that show the vertical range and areal distribution of the most of the species. Incidentally, some new evidence concerning the position of the Bear River formation is given, and large areas of Cretaceous strata in Utah are correlated with the formations east of the Rocky mountains more accurately than has heretofore been possible.

In addition to the aid received from Dr. C. A. White and the free use of the collections under his curatorship in the U. S. National Museum, I am under many obligations to Dr. W. H. Dall and to Mr. Charles T. Simpson, of the National Museum, for assistance in comparing fossils with recent species, and for valued opinions concerning the generic relations of doubtful forms; also to Prof. Alpheus Hyatt, who has examined several of the species of *Ammonitinæ* at my request, and has given me the benefit of his authoritative opinion as to their relationships.

T. W. S.

THE COLORADO FORMATION AND ITS INVERTEBRATE FAUNA.

By T. W. STANTON.

INTRODUCTION.

HISTORY AND DEFINITION OF THE COLORADO FORMATION.

For many years the well-known upper Missouri section has served as the basis for all studies in the Cretaceous formations of the great interior region of the United States. As first published in 1856, by Hall and Meek,¹ and with a few slight modifications, by Meek and Hayden,² it embodied the notes on the Cretaceous strata made by the two authors last named during the earliest of their geological reconnoissances in the upper Missouri river region. It has since been modified and enlarged from time to time by the same authors and by others, and made to include, more or less successfully, all the Upper Cretaceous strata in the region from Kansas to Arizona and from southern New Mexico far northward into British America.

In its original form this upper Missouri section was divided into five parts, which were simply designated by numbers, beginning at the base. The total thickness of the entire Cretaceous series of that region was at first estimated at not more than 650 feet. In 1861 Messrs. Meek and Hayden³ published a paper in which names were given to the five divisions, with the addition of lists of characteristic fossils and references to typical localities. It should be remembered that this is not a continuous section at any one locality, but it is generalized from all the outcrops seen over a very large area. The thickness assigned to each group is an estimate of its maximum development. The section, as republished in 1876 by Meek,⁴ who made no changes excepting in the nomenclature of a few of the fossils, is as follows:

¹ Mem. Am. Acad. Arts. and Sci., 2d ser., vol. v, p. 405.

² Proc. Acad. Nat. Sci. Phila., vol. VIII, p. 63.

³ Proc. Acad. Nat. Sci. Phila., 1861, p. 419.

⁴ U. S. Geol. Sur. of the Territories, vol. IX, pp. XXIV and XXV.

General section of the Cretaceous rocks of Nebraska.

Divisions and subdivisions.		Localities.	Estimated thickness.	
Upper Series.	Fox Hills Group. Formation No. 5.	Gray, ferruginous, and yellowish sandstone and arenaceous clays, containing <i>Belemnitella bulbosa</i> , <i>Nautilus Dekayi</i> , <i>Placenticeras placenta</i> , <i>P. lenticularis</i> , <i>Scaphites Conradi</i> , <i>S. Nicolleti</i> , <i>Baculites grandis</i> , <i>Pyropsis Bairdi</i> , <i>Piestochilus Culbertsoni</i> , <i>Pyrifusus Newberryi</i> , <i>Anchura Americana</i> , <i>Pseudobuccinum Nebrascensis</i> , <i>Mactra Warrenana</i> , <i>Cardium subquadratum</i> , and a great number of other molluscan fossils, together with bones of <i>Mosasaurus missouriensis</i> , etc.	Fox Hills, near Moreau river; near Long lake, above Fort Pierre; along the base of the Big Horn mountains, and on North and South Platte rivers.	500 feet.
	Fort Pierre Group. Formation No. 4.	Dark-gray and bluish plastic clays, containing, near the upper part, <i>Nautilus Dekayi</i>, <i>Placenticeras placenta</i>, <i>Baculites ovatus</i>, <i>B. compressus</i>, <i>Scaphites nodosus</i>, <i>Dentalium gracile</i>, <i>Crassatella Evansi</i>, <i>Cucullæa Nebrascensis</i>, <i>Inoceramus Sagensis</i>, <i>I. Nebrascensis</i>, <i>I. Vanuxemi</i>, bones of <i>Mosasaurus missouriensis</i>, etc. Middle zone nearly barren of fossils. Lower fossiliferous zone, containing <i>Ammonites complexus</i>, <i>Baculites ovatus</i>, <i>B. compressus</i>, <i>Heteroceras Mortoni</i>, <i>H. tortum</i>, <i>H. umbilicatum</i>, <i>H. cochleatum</i>, <i>Ptychoceras Mortoni</i>, <i>Odontobasis vinculum</i>, <i>Anisomyon borealis</i>, <i>Amauropsis paludiformis</i>, <i>Inoceramus sublævis</i>, <i>I. tenuilineatus</i>, bones of <i>Mosasaurus missouriensis</i>, etc. Dark bed of very fine unctuous clay, containing much carbonaceous matter, with veins and seams of gypsum, masses of sulphuret of iron, and numerous small scales of fishes. Local; filling depressions in the bed below.	Sage creek, Cheyenne river, and on White river above the Mauvaises Terres. Fort Pierre and out to Bad Lands; also down the Missouri on the high country to Great Bend. Great Bend of the Missouri below Fort Pierre. Near Bijou Hill, on the Missouri.	700 feet.
Equivalents of Upper or White Chalk and Mæstricht beds (Sénonien, d'Orbigny).				

General section of the Cretaceous rocks of Nebraska—Continued.

Divisions and subdivisions.			Localities.	Estimated thickness.	Equivalents of Lower or Gray Chalk and Upper Greensand of British geologists (Turonien and Cenomanien of d'Orbigny).
Lower Series.					
Dakota Group.	Formation No. 1.	Yellowish, reddish, and occasionally white sandstone, with at places alternations of various colored clays and beds and seams of impure lignite; also silicified wood, and great numbers of leaves of the higher types of dicotyledonous trees, with casts of <i>Pharella</i> ? <i>Dakotensis</i> , <i>Trigonarca Siouxensis</i> , <i>Cyrena arenarea</i> , <i>Margaritana Nebrascensis</i> , etc.	Hills back of the town of Dakota; also extensively developed in the surrounding country in Dakota county below the mouth of Big Sioux river; and thence extending southward into northeastern Kansas and beyond.	400 feet.	
Fort Benton Group.	Formation No. 2.	Dark-gray laminated clays, sometimes alternating near the upper part with seams and layers of soft gray and light-colored limestone. <i>Inoceramus problematicus</i> , <i>I. tenuirostratus</i> , <i>I. latus</i> ? <i>I. fragilis</i> , <i>Ostrea congesta</i> , <i>Veniella Mortoni</i> , <i>Pholadomya papyracea</i> , <i>Ammonites Mullanus</i> , <i>Prionocyclus Woolgari</i> , <i>Mortoniceras Shoshonense</i> , <i>Scaphites Warrenanus</i> , <i>S. larvæformis</i> , <i>S. ventricosus</i> , <i>S. vermiformis</i> , <i>Nautilus elegans</i> , etc.	Extensively developed near Fort Benton on the Upper Missouri; also along the latter from 10 miles above James river to Big Sioux river; and along the eastern slope of the Rocky mountains, as well as at the Black Hills.	800 feet.	
Niobrara Division.	Formation No. 3.	Lead-gray calcareous marl, weathering to a yellowish or whitish chalky appearance above. Containing large scales and other remains of fishes, and many specimens of <i>Ostrea congesta</i> attached to fragments of <i>Inoceramus</i> ; also several species of <i>Textularia</i> . Passing down into light, yellowish, and whitish limestone, containing great numbers of <i>Inoceramus problematicus</i> , <i>I. pseudomytiloides</i> , <i>I. aviculoides</i> , and <i>Ostrea congesta</i> , fish-scales, etc.	Bluffs along the Missouri below the Great Bend, to the vicinity of Big Sioux river; also below there on the tops of the hills.	200 feet.	

To complete the Upper Cretaceous section of this region there must be added to it at the top the great coal bearing Laramie series of fresh and brackish water beds, which were regarded as Tertiary at the time of the earlier explorations, but are now generally assigned to the Cretaceous; and in western Wyoming the Bear River formation must be interpolated. It is also a brackish-water formation, and was formerly

believed to be a part of the Laramie.¹ It has recently been shown to occupy a much lower horizon, probably about that of Dakota.

As explorations were extended throughout the West it was found that, while the divisions of the above sections can be recognized over a large area, there are regions in which they can be applied only with the greatest difficulty, if at all. They had been separated in the first place mainly on account of lithologic differences, though the lines thus drawn happened to coincide with decided faunal breaks in one or perhaps two instances. Naturally, the stratigraphic units thus defined are more or less restricted in their geographic distribution, and are sometimes represented in other regions by deposits of an entirely different character. For example, in large areas west of the Continental Divide the limestone and marls of the Niobrara are not found, they being variously represented at different localities by shales and sandstones. Under such circumstances it is very difficult to discriminate between the dark shales of the Fort Benton and those of the Fort Pierre, unless characteristic fossils are found. This difficulty was encountered by the geologists of the United States Geological Exploration of the Fortieth parallel, and as a solution of it Mr. Clarence King, the chief of that survey, proposed the new term Colorado Group "for the great clay group" of the Cretaceous, making it include the equivalents of the Fort Benton, Niobrara, and Fort Pierre groups of Meek and Hayden.

The name "Colorado Group" was first published in 1875 on one of the atlas sheets of the Fortieth Parallel Survey, and it was more fully defined by Messrs. King, Hague, and Emmons in vols. I and II of the final reports of the same survey. The name has since been used with the same meaning by several other geologists.²

But the lithologic classification of the Cretaceous formations adopted by the Fortieth Parallel Survey is often as difficult to apply as the older one which it was intended to replace, even in the region for which it was first proposed; for on approaching the western shore line of the Cretaceous sea along the eastern base of the Wasatch mountains, the Colorado formation ceases to be a "great clay group" bounded by sandstones above and below. On the contrary, there are several alternations of similar heavy beds of sandstone with dark shales throughout the entire series, and no good lithologic or structural reasons can be given for separating them into groups. The section at Coalville, Utah, to be given further on, is a good example of this. Recent paleontologic studies have shown that on the maps of the Fortieth Parallel Survey the upper limit of the Colorado formation at that place is really drawn not higher than the top of the Niobrara. It may be added that in that

¹Vide White, C. A.: On the Bear River Formation. *Am. Jour. Sci.*, vol. XLIII, 1892, pp. 91-97; and Stanton, T. W.: Stratigraphic Position of the Bear River Formation. *Ibid.*, pp. 98-115.

²For the nomenclature and grouping adopted by various authors who have written on the Cretaceous of this region see White, C. A.: A Review of the Cretaceous Formations of North America, Bull. No. 82, U. S. Geol. Sur., from which most of the historical statements here given were obtained.

region the paleontologic lines are not so sharply drawn as they are east of the Front range, though the fauna as a whole in the lower part of the series corresponds with that in the lower portion of the Meek and Hayden section, and is very different from that of the upper.

In the rapid reconnoissance of such large areas as were covered by the earlier surveys in the West there was little time for detailed paleontologic work, and the geologists were therefore often obliged to classify and describe the formations by their most obvious lithologic and structural characteristics. But such classification can be regarded only as tentative, and when, as in the case now under consideration, the lower portion of a "group" or formation is found to contain a fauna that is entirely distinct from that of the upper portion, while the latter is very closely related to the fauna of the overlying formation, it is evident that the plane of separation has not been drawn on the right horizon. A decided change in marine faunas occurring at approximately the same horizon over a large area is evidence of either a considerable time interval or of some great change in external physical conditions, and in either case it should have weight in geological classification, even though the character of the sediments may be so nearly the same both above and below the faunal break that no reason other than the paleontologic one can be seen for their division. Such a difference between adjacent marine fossil faunas certainly represents a more important event than the change from a sandstone to a shale or from a shale to a limestone. These general facts are universally admitted and numerous examples could be cited in which the dividing line between formations as widely separated in age as the Cambrian and the Carboniferous or the Jurassic and the Upper Cretaceous could not be determined until the fossils were studied. But when the faunas both belong to the same geologic period they are more closely related and the importance of such a faunal change is likely to be underestimated by the field geologist.

Meek and Hayden early recognized the fact that the most marked faunal break in their Cretaceous section is at the top of the Niobrara division, and for that reason the line between the "Lower Series" and the "Upper Series" was placed there. In Prof. Meek's last published work¹ he says:

In passing from the Niobrara group, however, into the succeeding rocks above, in which great numbers of fossils occur, not a single species, so far as known to the writer, has yet been found identical with any form yet known from either of the three divisions below. In addition to this, the upper surface of the Niobrara beds is, at several places on the Missouri river, seen to have been eroded into irregularities or depressions, previous to the deposition of the succeeding Fort Pierre group, thus giving additional evidence that some kind of a physical change (perhaps slight) occurs between the deposition of the latest portion of the Niobrara division and the first of the Fort Pierre beds.

It is now known that a few species do pass from the lower series to

¹ U. S. Geol. Sur. Terr., vol. IX, p. XXXII.

the upper, but this is exceptional. The great majority of the species and all of the abundant ones are distinct, consequently Prof. Meek's argument for making the primary division at the top of the Niobrara is not impaired.

In 1878, when describing the Cretaceous formations of northwestern Colorado, Dr. C. A. White¹ used the nomenclature of King, dividing the section into the Dakota, Colorado, and Fox Hills groups, but for reasons similar to those just enumerated he applied the term Colorado group only to the equivalents of the Fort Benton and the Niobrara, while the Fort Pierre was embodied in the Fox Hills group. These two groups as thus defined are equivalent respectively to the marine portions of the Lower Series and the Upper Series of Meek and Hayden, and are characterized by distinct marine faunas, though there may also be in either of them local intercalations of fresh-water or brackish-water deposits.

This method of grouping the formations was adopted by some of the other geologists of the Survey of the Territories, and it was used on the maps of the Atlas of Colorado.

Mr. George H. Eldridge² has recently published an excellent general review and discussion of the classification and nomenclature of the Western Cretaceous, in which he adopted the divisions as defined by Dr. White, but he proposed the new name Montana group for the combined Fort Pierre and Fox Hills. In this manner the confusion caused by using the name Fox Hills in two different senses is avoided, and the original names of the minor subdivisions may still be used in local sections where it is desirable.

After describing each member of the Upper Cretaceous section, especially as developed along the eastern base of the Front range in Colorado, Mr. Eldridge sums up the evidence thus:

From the foregoing details, the following relations of the several formations to each other may be clearly and legitimately deduced: First, the component strata of the Fort Benton and Niobrara frequently, and the life generally shade into each other; second, this is again even more forcibly paralleled in the sedimentation and life of the Fort Pierre and Fox Hills; third—and on the contrary—between the Niobrara and Fort Pierre, or, which is the same thing, between the Colorado and Montana groups (as was suggested they should be designated early in the paper), there is a differentiation of both sediments and life, greatly in excess of any similarities in these respects that may be noticed from time to time in any particular locality.

Some of the detailed evidence in support of these views will be given in subsequent paragraphs.

Mr. Eldridge has also described³ a local nonconformity at the top of the Colorado formation at Golden, Colo.

In the present paper the term Colorado formation is accepted in its restricted sense as defined by White and Eldridge. The species de-

¹ Ann. Rept. U. S. Geol. Sur. Terr. for 1876, pp. 1-60.

² Am. Jour. Sci., 3d ser., vol. XXXVIII, 1889, p. 313-321.

³ Bull. Philos. Soc. of Washington, vol. XI, 1890, p. 264.

scribed by Meek and others from the typical Fort Benton and Niobrara of the Upper Missouri section and from their undoubted equivalents in the Black hills and along the Front range in Colorado have been taken as the nucleus of the fauna. To these have been added others from the same beds and those from other regions that are associated with species believed to be characteristic of this horizon. Some fortunate discoveries of an unusually abundant and varied fauna in the Fort Benton of southern Colorado, and the careful comparison of collections from many localities, thus correlating the beds step by step, have added a considerable number of species to the fauna, some of them new and many more that have either been assigned to a higher horizon or described simply as Cretaceous without reference to any of its divisions. As a necessary result of recently ascertained facts concerning the vertical distribution of some of these species, certain strata that have usually been referred to the Montana formation in Utah and adjoining States are now transferred to the Colorado. This subject will be discussed somewhat in detail when the typical sections are described.

The Colorado formation has been recognized by means of its characteristic fossils in Iowa, Minnesota, the Dakotas, Nebraska, Kansas, Colorado, Wyoming, Montana, Utah, Arizona, and New Mexico. It is also well established that equivalent strata exist in Texas and the adjacent regions and over large areas in British America. In Texas the Eagle Ford shales and the Austin limestone are evidently the equivalent of the Fort Benton and the Niobrara, respectively, but their fauna is in some respects quite different from that of the typical Colorado and for that reason its peculiar species have been excluded, though many of those here described are known to occur in both regions, and it is probable that more thorough collecting will add many to the common list.

The species described from British America have been excluded because the geologists have often found difficulty there in discriminating between the Colorado and Montana formations, and consequently a number of the described upper Cretaceous species have not been assigned to either horizon. While many species evidently belong to the Colorado fauna, there are many others that are doubtful and must remain so until more is known of their associates and their stratigraphic position.¹ For similar reasons a few known species from portions of our area have been omitted, some of which probably belong to this fauna.

From southern Utah and from New Mexico a few species are included whose stratigraphic position is not definitely known, but they are usually associated at the same locality with known Colorado species.

The area to which the Colorado formation is thus arbitrarily re-

¹ Since the above was written Mr. J. F. Whiteaves has published descriptions of four new species of *Ammonites* from the Cretaceous rocks of Athabasca (Trans. Roy. Soc. Canada, sec. iv, 1892, pp. 111-119) and referred them to the horizon of the Colorado formation. They belong to genera that have not yet been found in that formation in the United States and are suggestive of an older horizon.

stricted is sufficiently large to show great variations in the nature and thickness of the sediments and considerable modifications of the faunas. With the 150 species of fossils all from one comparatively limited horizon, now for the first time brought together, it will be much less difficult to extend the correlation of beds belonging to the same horizon in this country, and to make comparisons with Cretaceous faunas as developed elsewhere.

The variations above mentioned can be best shown by describing a few typical sections in different parts of the area. The sections and their faunal lists will be given in greater detail in some cases where important new correlations are made.

GEOLOGIC DESCRIPTION.

THE EASTERN BORDER.

On the eastern border of the area in which the Colorado formation occurs the country is comparatively level; the Cretaceous beds are nearly horizontal and are frequently covered with drift, loess or other recent deposits, so that there are not many good exposures showing the character and the thickness of the different divisions. Consequently, but little detailed work has been done here and very few local sections have been published. It is known that in Iowa and Minnesota, east of the main Cretaceous area, there are many detached remnants that have escaped the general erosion and are evidence of the eastward extension of the Cretaceous sea. Only a few of these isolated localities have yielded characteristic fossils, but since they are in an undisturbed region and not very far distant from the typical Meek and Hayden section, the beds can usually be identified with reasonable certainty by their stratigraphic and lithologic relations.

In the valley of Sauk river, Minnesota, there are exposures of Fort Benton shales that have been described by Mr. J. H. Kloos.¹ He states that in that region the Cretaceous rests on the older crystalline rocks, and only the Fort Benton division seems to be represented. One section obtained from a well showed 73 feet of dark blue clay and shales with two thin seams of lignite. The few fossils that were found were submitted to Prof. F. B. Meek, and proved to be characteristic Benton forms. He identified *Inoceramus problematicus* (= *I. labiatus*) and *Ammonites percarinatus* (= *Prionotropis woolgari*) among them.

Prof. N. H. Winchell² states that similar beds extend farther south, along the Minnesota river and the Cottonwood, and at other localities there are exposures of sandstone that are referred to the Dakota, while at New Ulm there is an outcrop of limestone that is believed to represent the Niobrara.

¹ Kloos, J. H. Cretaceous Basin in the Sauk Valley, Am. Jour. Sci., 3d ser., vol. III, 1872, pp. 17-26.

² Winchell, N. H. The Cretaceous in Minnesota, Minn. Acad. Nat. Sci. Bull. vol. I, 1878, pp. 349-390.

In western Iowa the Cretaceous beds are somewhat better developed and the exposures are more satisfactory. The following description of the general section from the base upward is condensed from Dr. White's account in the *Geology of Iowa*.¹

Iowa Cretaceous section.

	Feet.
1. Nishnabotany sandstone:	
Rather coarse grained, friable, more or less ferruginous sandstone, with occasional thin, irregular layers of clay. Fossils: Fragments of angiospermous leaves. Maximum thickness.....	100
2. Woodbury sandstones and shales:	
Alternating thin beds of shale and sandstone, the former predominating. The shales vary in character, and at some places a lignitic band is shown. Fossils: <i>Inoceramus labiatus</i> and casts of a few other Lamelli-branches are occasionally found, and leaves of <i>Salix meekii</i> and <i>Sassafras cretaceum</i> also occur. Maximum thickness.....	150
3. Inoceramus beds:	
Impure chalky limestone and marls with <i>Inoceramus labiatus</i> , <i>Ostrea congesta</i> , and remains of several genera of fishes. Thickness	50

A detailed section measured by Mr. O. H. St. John² along the Big Sioux river above Sioux City, in which the basal sandstone is not represented, shows 45 feet of the *Inoceramus* beds and 119 feet of the underlying Woodbury sandstones and shales.

The original section of Meek and Hayden was described from this same neighborhood, and the divisions above given correspond in a general way to the Dakota, Fort Benton, and Niobrara groups, though it seems possible that a part of the Dakota is included in the Woodbury sandstones and shales. Evidently there is a gradual transition from the one formation to the other at this point, and if marine fossils were found to the bottom of the series we should expect them to belong to the same fauna as those in the upper beds. Four species of invertebrates have been described by Meek and Hayden from the "Dakota group at the mouth of Big Sioux river." Future studies may prove that they belong to the Colorado fauna, but as I have not been able to identify them satisfactorily with species that occur in the beds above the Dakota elsewhere, it has seemed best to omit the description of them. They are:

Cyrena dakotensis.
Trigonarca siouxensis.

Mactra siouxensis.
Arcopagella? macrodonta.

Southwestward from this locality the Cretaceous occupies a broad irregular belt through Nebraska and Kansas, lying unconformably on the Carboniferous, and farther south on the red beds that are usually referred to the Jura-Trias. The strata dip gently to the northwest, and in the western part of these states the Cretaceous is overlain by fresh-water deposits of late Tertiary age. Since the beds are nearly horizon-

¹Rept. Geol. Sur. of Iowa, vol. I, Des Moines, 1870, pp. 285-294.

²Rept. Geol. Sur. of Iowa, vol. II, pp. 196-199.

tal and the Tertiary deposits are not very thick, the streams have cut through into the Cretaceous for some distance within the Tertiary area, thus making its boundary very irregular. Only a part of it has been accurately mapped.

Until recently all of the Cretaceous strata of Kansas have been referred to the Dakota and the Colorado formations, and there is no doubt that these two formations do cover a large area within the state, but it has been shown¹ that a part of the Lower Cretaceous Comanche series, with some of its characteristic species of fossils, occurs in several of the southern counties, and the probable existence of the Montana formation in the northwestern part of the state has been reported.

Prof. B. F. Mudge, who spent several seasons in collecting vertebrate fossils from the Niobrara division in Kansas and visited the most of the Cretaceous outcrops in the state, estimated² the total thickness of the Cretaceous at 960 feet, of which 500 feet was assigned to the Dakota and the remainder to the Niobrara.

The fact that the beds above the Dakota contain a greater proportion of calcareous material than usual led Prof. Mudge to conclude that they all belong to the Niobrara and that the Fort Benton shales are absent, but it is evident from the description that his Niobrara represents the whole of the Colorado formation. The data for the following section of the Upper Cretaceous strata of Kansas³ are taken from the paper last cited:

Kansas Upper Cretaceous section.

	Feet.
1. Dakota formation.	
Brown and variegated sandstone of varying degrees of hardness, frequently with ferruginous concretions, and usually interstratified with thin beds of clay shales, and one or more seams of lignite. Fossil plants abundant; animal ³ remains rare. Estimated thickness.....	500
2. Colorado formation.	
a. Interstratified shales and thin layers of limestone containing <i>Inoceramus labiatus</i> and a few other mollusks, with occasional fish remains.....	140
b. Bluish black or slate colored shale with many concretions containing <i>Prionotropis woolgari</i> , <i>Scaphites</i> , <i>Inoceramus</i> , etc.....	60
c. Massive chalky limestone with <i>Inoceramus deformis</i> , <i>Ostrea congesta</i> , and occasional remains of fish and saurians.....	60
d. Buff and white chalk or chalky limestone with calcareous shales. Fossils: <i>Uintacrinus socialis</i> , <i>Inoceramus labiatus</i> , <i>I. deformis</i> ?, <i>Ostrea congesta</i> , <i>Radio-lites</i> ?, <i>Baculites anceps</i> ? and great numbers of vertebrates, including birds, reptiles, and fishes. Thickness	200
Estimated total thickness of the Colorado	460

¹ Cragin, F. W. The Cheyenne Sandstone and the Neocomian Shales of Kansas. Washburn College Lab. of Nat. Hist. Bull., vol. II, No. 11, and Am. Geologist, vol. VI, p. 233, and vol. VII, p. 23.

² Mudge, B. F. Notes on the Tertiary and Cretaceous Periods of Kansas, U. S. Geol. Sur. Terr. Ann. Rept. for 1875, pp. 277-294.

³ 15 species of invertebrates, none of which have been found in the overlying strata, have been described by Meek (U. S. Geol. Sur. Terr., vol. IX) and White (Proc. U. S. National Museum, vol. II) from this horizon in Saline county, Kansas.

THE UPPER MISSOURI REGION.

The immense area of Cretaceous in Nebraska, North Dakota, South Dakota, and Montana has had little careful study excepting along the course of the Missouri river and around the base of the Black hills. The section quoted at the beginning of this paper gives a general description of the beds as developed in this region, but they are subject to considerable local variation and it is especially worthy of note that the calcareous Niobrara division disappears entirely in Montana, as it does along the eastern base of the Wasatch mountains and elsewhere in Utah, and in southwestern Colorado.

In the Black hills the strata have been most fully described by Prof. Henry Newton.¹ He was able to recognize there all five of the divisions of the Upper Missouri section. The principal differences as compared with that section are the presence of several thin beds of sandstone interstratified with the upper portion of the Fort Benton shales, and the fact that nearly all of the divisions are much thinner. The estimated thicknesses are:

Black hills Cretaceous section.

	Feet.
1. Dakota.	
Coarse yellow or red sandstones with discontinuous variegated clays. In some places a part of the sandstone is soft and white, and at other localities it is changed to a dense quartzite.....	250-400
2. Fort Benton.	
Dark plastic clays which usually contain large quantities of alkaline salts and selenite. Thin bedded calcareous sandstones, containing numerous fossils, are frequently found in the upper part.	200-300
3. Niobrara.	
Gray calcareous shales and marls with some limestone; <i>Inoceramus labiatus</i> and <i>Ostrea congesta</i> very numerous. Thickness, roughly estimated	100-200
4. Fort Pierre.	
Dark gray and bluish plastic clays with many fossiliferous calcareous concretions in the upper part. Thickness, estimated.....	150-250
5. Fox Hills.	
Ferruginous sandstone, with <i>Veniella humilis</i> , <i>Sphæriola transversa</i> , <i>Ideonarca shumardi</i> , etc. Thickness, roughly estimated	100

According to these estimates the total thickness of the Colorado formation in the Black hills region is only 300 to 500 feet, and the entire marine Cretaceous section is less than 1,000 feet. It should be remembered that no accurate measurements of local sections were made. The following species of fossils have been reported from the Colorado beds of this region:

<i>Ostrea congesta.</i>	<i>Prionotropis woolgari.</i>
<i>Inoceramus labiatus.</i>	<i>Prionocyclus wyomingensis.</i>
<i>Inoceramus fragilis.</i>	<i>Scaphites warreni.</i>
<i>Inoceramus perplexus.</i>	<i>Scaphites wyomingensis.</i>
<i>Inoceramus altus.</i>	<i>Scaphites larvæformis.</i>
<i>Fusus shumardi.</i>	

¹ Newton, Henry, and Walter P. Jenney, Geol. of the Black Hills of Dakota, Washington, 1880. The Cretaceous is described on pp. 169-186.

In Montana the Fort Benton division of the Colorado formation is well represented, and the types of many of its characteristic species were collected in that state. According to Meek and Hayden¹ this division attains a thickness of about 800 feet in the neighborhood of Fort Benton. The following species of invertebrates have been obtained within a few miles of that locality, but their exact vertical range in the local section has not been published:

Inoceramus fragilis.	Pholadomya papyracea.
Inoceramus umbonatus.	Scaphites vermiformis.
Inoceramus exogyroides.	Scaphites ventricosus.
Inoceramus tenuirostratus.	Scaphites mullananus.
Inoceramus undabundus.	Nautilus elegans.

Nearly all of these have been found in the Colorado formation or its equivalents at other localities and none of them is known to occur at a higher horizon.

The geologists who have recently studied the Cretaceous coal fields of Montana have been unable to divide the marine portion of the Upper Cretaceous into distinct formations, and the collections of fossils have not been sufficient to indicate the paleontologic break if there is one. The following section, adapted from Mr. W. H. Weed's paper² on "The Cinnabar and Bozeman Coal Fields of Montana," shows the character of the strata up to and including the lower portion of the Laramie.

Cretaceous section of Cinnabar mountain, Montana.

Laramie:	Feet.
Sandstones, containing coal	800
Coal seam	5
Sandstones, white, massive, cross-bedded.....	125
	935
Colorado and Montana:	
Fissile, argillaceous sandstones and shales.....	240
Shales, generally crumbly, with layers of black bituminous shale, and harder sandy ledges.....	450
Shaly sandstones and limestones	225
Sandstone	40
Sandy, splintering, gray shales and limestones	165
Black bituminous shales	500
Limestone	40
Black shales, sometimes arenaceous	400
Sandstone	10
Black and dark-blue shales.....	250
Sandstone	15
Sandy shales.....	75
Sandstone	10

¹ Proc. Acad. Nat. Sci., Phila., 1861, p. 421; U. S. Geol. Sur. Terr., vol. IX, p. XXIX.

² Bull. Geol. Soc. Am., vol. II, 1891, p. 352.

Colorado and Montana—Continued.

	Feet.
Thinly laminated arenaceous shales with <i>Ostrea anomioides</i>	340
Sandstones	15
Shales	75
	2, 850

Dakota:

Quartzite	30
Limestone with great numbers of a small fresh-water gasteropod	10
Sandy shales	150
Red earthy limestones, magnesian	50
Conglomerate	40
Sandstone and shales	95
Sandstone	151
	526

Total Cretaceous..... 4, 311

Sections at other localities give a much greater total thickness, but the marine portion, or combined Colorado and Montana, seems not to vary greatly. It is evident that both of these formations are represented in the section, but there seems to be no lithologic or structural reason for making a division and all of the fossils yet reported from the locality belong to the Colorado fauna and probably all came from near the horizon of *Ostrea anomioides*. The following species were collected there by members of the U. S. Geological Survey of the Territories.

<i>Ostrea anomioides</i> .	<i>Baculites asper</i> ?
<i>Trigonia</i> , related to <i>T. evansana</i> .	<i>Scaphites ventricosus</i> .
<i>Inoceramus</i> sp.?	

At a locality near the Missouri river below Gallatin, Montana, where the same beds are exposed, the first three of the above-named species occur, and associated with them are *Corbicula inflexa*, *Pharella? pealei*, and a number of others¹ represented by casts that can not be specifically determined.

COLORADO AND NEW MEXICO.

Along the eastern base of the Front range in Colorado the Upper Cretaceous formations are well developed and easily distinguishable both by lithologic features and by an abundance of characteristic fossils. From the northern boundary of the state to the Arkansas river and beyond, the first prominent "hogback," or foothill of the mountains is composed of the sandstones and conglomerate of the Dakota. It is so constant lithologically that it can be readily recognized without the aid of the plants which are the only fossils that are commonly found in it in this region. On the plain immediately east of the Dakota ridge the shales and limestones of the Colorado, the softer clay shales and

¹ See Prof. Meek's lists in Ann. Rept. U. S. Geol. Sur. Terr., for 1872, pp. 474, 475.

the sandstones of the Montana, and the coal-bearing sandstones and shales of the Laramie are exposed in the order in which they are named. There are numerous fossiliferous zones throughout the marine portion of the strata, and it is usually not difficult to trace the characteristic species of the Colorado and Montana formations, respectively, almost to the dividing line between the two formations.

The section given below is based on descriptions of the Cretaceous strata in the Denver region by Mr. Geo. H. Eldridge.¹ Although originally intended only for a limited area surrounding Denver, Mr. Eldridge's description with very slight modifications will apply equally well to any part of the Cretaceous belt between Wyoming on the north and Pike's peak on the south. Perhaps the Laramie portion of the section should be excepted in this statement, as it is not so well developed in the northern and southern portions of this area as in the Denver basin.

Cretaceous section in central Colorado.

Dakota:	Feet.
A thin bed of conglomerate composed of well-rounded quartzose pebbles united by strong siliceous cement. Hard, usually gray, sandstone in two prominent benches separated by a band of fire clay. Fossil plants are abundant at some localities. Total thickness of the formation about	300
Colorado:	
Fort Benton—	
Dark shales with frequent intercalations of fossiliferous drab limestone in the upper third. <i>Inoceramus labiatus</i> is the most abundant and characteristic species and <i>Prionotropis woolgari</i> is occasionally found	400-500
Niobrara—	
Drab-white limestone containing <i>Inoceramus deformis</i> , <i>I. labiatus</i> , <i>Ostrea congesta</i> , etc.	40
Gray clays and buff siliceo-calcareous shales with <i>Ostrea congesta</i> and numerous scales of fishes.	260
Total thickness of Colorado formation.	700-800
Montana:	
Fort Pierre—	
Drab shaly clays with numerous highly fossiliferous concretions of drab limestone and occasional unimportant bands of sandstone. Characteristic fossils: ² <i>Inoceramus cripisii</i> , <i>I. proximus</i> , <i>Avicula linguiformis</i> , <i>A. nebrascana</i> , <i>Lucina occidentalis</i> , <i>Anisomyon</i> (several species), <i>Ptychoceras mortoni</i> , <i>P. crassum</i> , <i>Heteroceras</i> (several species), <i>Baculites ovatus</i> , <i>B. compressus</i> , <i>Placentoceras placenta</i> , <i>Sphenodiscus lenticulare</i> , <i>Scaphites nodosus</i> , <i>Nautilus dekayi</i> , etc. Thickness	7, 700

¹ On some Stratigraphical and Structural Features of the Country about Denver, Colorado. Proc. Colo. Sci. Soc., vol. III, pp. 93-97. On certain peculiar Structural Features in the Foot hill Region of the Rocky mountains near Denver, Colorado. Bull. Philos. Soc. of Washington, vol. XI, p. 249.

² The fauna contains a large number of species the most of which are figured by Meek, U. S. Geol. Sur. Terr., vol. IX, pls. 11-27.

Montana—Continued.

Feet.

Fox Hills—

Arenaceous clays capped by a bed of yellow fossiliferous sandstone.

Fossils:¹ *Cardium speciosum*, *Mactra alta*, *Tancredia americana*.*Veniella humilis*, *Callista deweyi*, *C. owenana*, *Sphaeriola cordata*,*Liopistha undata*, *Anchura americana*, *Scaphites conradi*, etc. Thick-

ness 800-1,000

Total thickness of Montana formation 8,700

Laramie:

Sandstones and coal beds, about 400

Clays, ironstones, and rarely coal beds 800

Fossils: plants and fresh and brackish-water mollusks

Total thickness 1,200

The Fort Pierre shales here have a much greater development than in any other part of the Rocky mountain region. With this exception the section is almost identical with Meek and Hayden's Upper Missouri section.

Southward from the neighborhood of Denver the Montana formation becomes much thinner, until, on the Arkansas river between Canyon city and Pueblo, its thickness is approximately 3,000 feet. It is also less fossiliferous and more uniform in lithologic character, so that the Fox Hills is not usually recognizable as a distinct division, though the fossiliferous zone, with its characteristic species at the top of the Fox Hills, has been observed at Colorado Springs, and the underlying shales at that place and in the Arkansas valley yield some Fort Pierre forms, such as *Inoceramus cripsii*, *I. proximus*, *Lucina occidentalis*, *Baculites ovatus*, *Scaphites nodosus*, *Heteroceras*, etc., but throughout the formation as a whole fossils are not so numerous either in species or individuals as they are in the section last described.

In the area now under consideration the Colorado formation becomes a more important feature of the geology on account of the greater area that it covers and of the better development of its fauna. The chief cause of its increased area is a low anticlinal fold extending out into the plain as a prolongation of the axis of the Front range. The erosion that has planed off this fold until it is scarcely noticeable as a topographic feature has removed the Laramie and Montana strata from an area at least 25 miles wide, and at a few places along the crest of the fold has just reached the Dakota sandstone.² Consequently the nearly horizontal shales and limestones of the Colorado form the surface over a large area,³ and are well exposed in long bluffs on the Arkansas, the Cucharas, and other streams, and also in the usual narrow belt along the foothills.

The characteristic Fort Benton shales resting on Dakota sandstone vary considerably in thickness. Near the mountains at Canyon city

¹ Some of these also occur in the Fort Pierre division.

² The Dakota is exposed on the bank of Arkansas river 8 miles above Pueblo and on the plains 10 miles east of Cucharas.

³ On the geological sheets of Hayden's Atlas of Colorado the area assigned to the Colorado formation along the Front range and in the southern central part of the state is too large on account of the fact that the Fort Pierre shales are all mapped as Colorado, although the legend states that they are included in the Fox Hills.

the thickness is 400 to 500 feet, but out on the plain it decreases until it is less than 300 feet.

About the middle of the dark shales there is always a calcareous zone, sometimes 40 or 50 feet thick, consisting of alternating layers of shale and drab limestone, the latter full of *Inoceramus labiatus*. The upper 150 feet of dark shale frequently contains brown or drab calcareous concretions, some of which are fossiliferous. Near Carlile Springs, on the Arkansas river, 18 miles west of Pueblo, the upper part of this zone yielded the following species:

Exogyra suborbiculata.
Ostrea lugubris.
Ostrea malachitensis.
Inoceramus fragilis.
Cardium pauperculum.
Veniella mortoni.
Anatina lineata.

Liopistha concentrica.
Turritella whitei.
Amauropsis bulbiformis.
Xenophora simpsoni.
Pugnellus fusiformis.
Rostellites dalli.
Prionotropis hyatti.

Above the Fort Benton shales there is a bed of rather coarse massive gray sandstone which at Carlile Springs is almost 15 feet thick. It is here capped by 1 to 2 feet of brown calcareous sandstone containing *Ostrea lugubris*, impressions of *Prionocyclus wyomingensis*, and numerous shark's teeth. Above this is about 40 feet of light-colored, compact limestone with *Inoceramus deformis*, *I. labiatus*, and *Ostrea congesta*, passing up into light gray and buff calcareous shales with *Ostrea congesta*.

The section is essentially the same as the one in the Denver region, with the addition of the sandstone at the top of the Fort Benton shales. This new feature is not distributed over a very large area, nor is it constant even in the region under consideration, but it is rendered important by the fact that at some localities it is very fossiliferous and contains a varied littoral fauna, part of which had previously been known only in a limited area in northern Utah where its stratigraphic relations were not clear. East of the mountains this sandstone was not seen farther north than Colorado Springs, where it is 10 feet thick. On the Arkansas river above Pueblo it is from 15 to 20 feet thick. Along the foothills in the neighborhood of Canyon city its thickness varies from 4 to 10 feet. At some localities in Huerfano park, where it is very fossiliferous, it is 40 feet thick, and for convenience in accurately referring the species to their horizon I have there called it the *Pugnellus* sandstone on account of the abundance of the characteristic fossil, *Pugnellus fusiformis*. Usually it is a compact, massive, or heavy bedded sandstone of uniform texture throughout, but at the localities where it is very fossiliferous the fossils occur in thin bands and lenticular masses of hard calcareous sandstone, while the larger part of the rock is more friable and sometimes contains partings of shale.

This thin bed of sandstone shows that over a considerable area there was a brief cessation and probably a reversal of the downward movement of the Fort Benton sea bottom just prior to the deposition of the Niobrara limestone. Both the character of the sediments and the con-

tained fossils indicate that the bed was deposited in shallow waters not far from land.

The band of brown calcareous sandstone above the Pugnellus sandstone is rather more persistent, and it always contains sharks' teeth and impressions of *Prionocyclus wyomingensis*, and usually *Ostrea lugubris*. Its thickness varies from 1 to 4 feet.

The Cretaceous section of Huerfano park, Huerfano county, Colorado, is entirely similar to that of the Arkansas valley just described, but as it has furnished so large a proportion of the species here described it deserves a separate notice in order that the evidence on which these species are referred to the Colorado formation may be given.

The "park" is a synclinal basin almost surrounded by the uplifts of the Wet mountains on the east and north and of the Sangre De Cristo range on the west and southwest. The central and larger portion of this basin is filled by a thick series of sediments of Eocene and later Tertiary age.¹ The Cretaceous strata are exposed at many places around the margin, especially on the east, north, and west sides. The entire series from the Dakota to the Laramie, inclusive, is represented, but the Montana and Laramie are not often well exposed.

The fossils were nearly all collected from a single bed, the Pugnellus sandstone, which is easily recognized in all its outcrops both by its position and by its fossils. The most prolific localities examined are near Quillian's ranch on Williams creek, on Muddy creek about 10 miles above Gardner post-office, in Poison canyon, and near Malachite post-office on the north side of Huerfano river. The Pugnellus sandstone at these four localities has yielded the following list of species, the majority of which were found at all the localities:

Ostrea lugubris.
Ostrea malachitensis.
Exogyra suborbiculata.
Anomia subquadrata.
Gervillia propleura.
Avicula gastroides.
Inoceramus labiatus.
Inoceramus fragilis.
Solemya? *obscura*.
Pinna petrina.
Yoldia subelliptica.
Trigonarca obliqua.
Lucina juvenis.
Cardium pauperculum.
Tapes cyprineriformis.
Legumen? ———.
Tellina (*Palæomæra*) *whitei*.
Siliqua huerfanensis.
Pholadomya coloradoensis.
Anatina lineata.
Liopistha (*Psilomya*) *concentrica*.
Mactra emmonsii.

Mactra huerfanensis.
Turritella whitei.
Xenophora simpsoni.
Gyrodes depressa.
Gyrodes conradi.
Amauropsis bulbiformis.
Mesostoma occidentalis.
Pugnellus fusiformis.
Fusus (*Neptunea?*) *venenatus*.
Tritonidea? *huerfanensis*.
Fasciolaria? (*Cryptorhytis*) *utahensis*.
Pyropsis coloradoensis.
Rostellites dalli.
Rostellites ambigua.
Rostellites gracilis.
Cancellaria malachitensis.
Actæon propinquus.
Haminea truncata.
Placenticeras ———.
Prionotropis hyatti.
Cassidulus stantoni.

¹ Hills, R. C.: Tertiary beds of the Huerfano river basin. Proc. Colo. Sci. Soc., vol. III, 1890, pp. 148-164, 217-223.

It should be noted that this list contains 13 of the 14 species collected from the upper part of the undisturbed Fort Benton shales in the Arkansas valley.

The stratigraphic evidence that the Pugnellus sandstone is near the top of the lower division of the Colorado formation is equally conclusive. A section measured on Muddy creek gives the following succession of strata in ascending order:

Dakota:	Hard brown and gray sandstone with plant remains, not fully exposed.	
		Feet.
Colorado:		
	Dark clay shales.....	100
	Gray limestone in thin bands alternating with shale. <i>Inoceramus labiatus</i> abundant.....	30
	Dark shale.....	300
	Rather coarse gray and yellowish sandstone, becoming shaly above, with occasional very fossiliferous bands and lenticular masses containing the species listed above.....	40 to 50
	Brown calcareous sandstone with <i>Ostrea congesta</i> , <i>Prionocyclus wyomingensis</i> , and shark's teeth	4
	Light drab limestone with <i>Inoceramus deformis</i> , <i>I. labiatus</i> , and <i>Ostrea congesta</i> passing up into calcareous shales.....	75
	Total thickness of Colorado exposed	559

Other localities in the park show that the upper bed of limestone is overlain by 300 to 400 feet of light gray or buff calcareous shales, succeeded by the drab clays of the Montana formation, with a probable thickness of 3,000 feet. The latter have yielded specimens of *Inoceramus proximus*, *Lucina occidentalis*, *Baculites ovatus*, *Ptychoceras*, and a few other characteristic forms.

The southern continuation of the Arkansas valley Cretaceous area in Colorado and northeastern New Mexico has been described by Dr. J. S. Newberry,¹ Prof. J. J. Stevenson,² and others.³ From these descriptions it is evident that the Colorado formation there retains about the same lithologic and paleontologic features as in the region above described, excepting that the Pugnellus sandstone with its shallow-water fauna has not been noticed, and there seems to be a greater proportion of limestone throughout the formation.

Dr. Newberry states that on the banks of the Canadian river⁴ the "Middle Cretaceous" exposures are from 800 to 1,000 feet thick, consisting mostly of blue limestone interstratified with dark blue and

¹ Macomb's exploring expedition from Santa Fé, N. Mex., to junction of Grand and Green rivers. Geol. Rept., Washington, 1876, pp. 32-35.

² U. S. Geog. and Geol. Surveys west of the One hundredth meridian, vol. III. Supplement, pp. 88-158. and Am. Geologist, vol. III, pp. 391-397.

³ Prof. Jules Marcou visited this region in 1853 in connection with the Pacific railroad surveys, and his observations were published in vol. III of the reports of that survey, in the Geology of North America, Zurich, 1858, and elsewhere. In an article on "the Mesozoic series of New Mexico" (Am. Geologist, vol. IV, 1889, p. 155-165 and 216-229) the same author gives titles of most of the geological reports relating to New Mexico.

⁴ Op. cit., p. 33.

brownish bituminous and calcareous shales. *Inoceramus labiatus* and *Gryphæa newberryi*¹ range from bottom to top of this series, and in the upper portion *Inoceramus fragilis*, *Ostrea congesta*, *O. elegantula*, *Prionotropis woolgari*, etc., also occur.

In western New Mexico and southwestern Colorado the Cretaceous section contains no limestones, or only very thin bands of local extent that are seldom exposed, and the same statement will apply to the entire area between the Continental Divide and the Wasatch mountains. The calcareous beds of the Niobrara division that have served as a convenient reference plane in all the region east of the mountains are absent. The section in the area drained by the San Juan river naturally falls into three lithologic divisions, the lowest of which is a series of coarse sandstones, with some beds of shale, and in the upper portion one or more coal beds. The middle division consists of dark clay shales, 1,200 to 1,500 feet in thickness, and is overlain by a thick series of coal-bearing sandstones, shales and marls forming the upper division. These are the members of Dr. Newberry's general section,² and similar divisions have been made by other geologists who have described the region, though they have sometimes been still further subdivided, and there have been differences of opinion as to the correlation of certain parts of the section with the formations east of the mountains. All have agreed, however, that the sandstones at the base (or at least the upper part of them) belong to the Dakota formation and that the Colorado formation is represented in the shales of the middle division.³

Here and in other portions of western Colorado the larger part of the coal-bearing sandstones and shales of the upper division was referred to the Fox Hills group by the members of the Geological Survey of the Territories, and it is so mapped in Hayden's Atlas of Colorado, the reason for this reference being that marine Cretaceous (Fox Hills) fossils were found at various horizons above the coal beds.⁴ Others have referred all of the productive coal measures of this area to the Laramie,⁵ basing their correlation on the stratigraphy, the lithologic character of the beds, and the evidence of the fossil plants. There is no doubt that Fox Hills

¹ Throughout this bulletin the names of fossils are usually changed so as to conform to the nomenclature adopted in the descriptions that are to follow. *Gryphæa newberryi* is the Upper Cretaceous form so frequently referred to in Dr. Newberry's report under the name *Gryphæa piteheri*.

² Op. cit., p. 32.

³ It should be remarked that the molluscan fossils reported by Dr. Newberry from the lower division seem to belong with the fauna of the overlying shales, and in southern Utah the coal-bearing sandstones at the base of the Cretaceous have yielded fossils that I regard as a part of the Colorado fauna.

⁴ For detailed sections and descriptions of Cretaceous in southwestern Colorado, see report of W. H. Holmes in Ann. Rept. U. S. Geol. Sur. Terr. for 1875, pp. 242-267.

In western Colorado: Reports of A. C. Peale, idem, for 1874, pp. 128-155, and for 1876, pp. 170-180; of C. A. White, ibid., pp. 19, 28-34, and other reports in the same series.

⁵ Lakes, A.: Geology of Colorado coal fields. Ann. Rept. State School of Mines, Denver, 1889, pp. 19, 148, 162, etc.

Hills, R. C.: Orographic and structural features of Rocky mountain geology. Proc. Colo. Sci. Soc. vol. III, 1890, p. 380 et seq.

species of fossils have been found at several places well up in the series. I have collected *Inoceramus cripisii*, *Mactra alta*, *Cardium*, *Baculites compressus*, and *Placenticeras placenta*, var. *intercalaris*, in Mancos canyon from a bed that seemed to be 800 to 1,000 feet above the base of the coal-bearing sandstones. No evidence of faulting was seen there. It is beyond the scope of this paper, however, to discuss either the age of these upper beds or the more general subject of the delimitation of the Laramie formation. There is need of much detailed work in some parts of the supposed Laramie area, and the evidence from all possible sources must be collected and considered before the latter question can be dismissed with a final solution.

The shales of the middle division attain a thickness of 1,200 to 1,500 feet in the San Juan valley, and farther north in western Colorado they are still thicker. It has already been intimated that these shales are of much the same character throughout and are apparently the product of continuous sedimentation, but the characteristic fossils of the Colorado formation are confined to their lower half. The upper half is usually barren of fossils, though a few species belonging to the Montana fauna have been found at the top. Along the Mancos river north of Mesa Verde and in the valley of Animas river where I have made collections the fossiliferous zones are as follows:

	Feet.
1. Soft dark clay shales resting on Dakota sandstone. ¹ Numerous specimens of <i>Gryphaea newberryi</i> in upper portion	120
2. Light drab argillaceous limestone with <i>Inoceramus labiatus</i> . This is seldom exposed and probably not continuous.....	4-6
3. Dark clay shales with a large <i>Inoceramus</i> covered with <i>Ostrea congesta</i> , and calcareous concretions, a few of which contain <i>Inoceramus</i> and <i>Baculites gracilis</i> ?	250
4. Thin bands of brown arenaceous limestone and occasional concretions alternating with shales. Fossils abundant, including <i>Inoceramus labiatus</i> , <i>I. fragilis</i> , <i>I. dimidiatus</i> , <i>Ostrea lugubris</i> , and <i>Prionocyclus macombi</i>	8-10

For about 200 feet above this zone there are fragments of a large *Inoceramus*, apparently like *I. deformis*, covered with *Ostrea congesta*. No fossils were found in the 600 or 700 feet of shales above this horizon.

Although the fauna of these beds is not large it contains several characteristic species and it is believed to prove that the fossiliferous beds above described are the approximate equivalent of the Colorado formation and that the overlying shales should not be included in that formation. Wherever fossils have been reported from the upper half of the shale division in western Colorado and eastern Utah they are of Montana formation species and the two faunas never seem to be blended¹ in that region.

Northward, in the valleys of Grand and Gunnison rivers and their tributaries in Colorado and of Green and Price rivers in Utah, the

¹ Mr. W. H. Holmes reports the occurrence of *Scaphites warreni*, *Inoceramus barabini*, and *Baculites ovatus* in the same bed on the San Juan river from about the horizon of the zone No. 4 above described. I have been unable to find this collection, but I have reason to believe that the last two species were incorrectly identified.

Colorado formation is still mainly composed of dark clay shales, though there are occasionally thin intercalations of sandstone. A section on Gunnison river, opposite Roubideau's creek, described by Dr. Peale.¹ which shows the general character well, is as follows:

	Feet.
1. Shaly sandstones, with interlaminated argillaceous beds, extending from the top of the bluff on the river to the base of the first bluff north of the river. The beds are for the most part concealed.....	175
2. Coarse yellow sandstone with calcite	
3. Gray laminated sandstone.....	
4. Thin laminæ of grayish sandstone shales, with fine black argillaceous shales, gypsiferous and calcareous, containing <i>Inoceramus</i> , <i>Ostrea lugubris</i> (Conrad), and other Cretaceous fossils.....	125½
5. Yellowish sandstone shales, with quantities of <i>Inoceramus</i> and <i>Ostrea</i> especially abundant near the top, where there is a layer of black shales.....	40
6. Black argillaceous shales, partly concealed by débris	38
7. Coarse yellow, gypsiferous, and calcareous sandstones, with layer at top, breaking into pencil-like pieces one to two inches long and an eighth of an inch in thickness	50½
8. Sandstone shales	120
9. Fine black argillaceous shales	
10. Coarse yellow calcareous sandstone, resembling that described under No. 7.	1
11. Fine black argillaceous shales, with bands of sandstone (fossiliferous), species of <i>Inoceramus</i> and <i>Ostrea</i>	36
12. Hard gray sandstone	1
13. Very fine soft black argillaceous shales, with a few laminæ of gray sandstone. In the lower part of the group the shales are coal-black, but as we ascend they become gray-black. Nearly all the layers are fossiliferous. Among the forms are <i>Prionocyclus wyomingensis</i> , <i>Scaphites [warreni]</i> , and <i>Inoceramus [labiatus]</i> . They are especially abundant near the top...	66½
14. Fine gray and yellowish shales	34
15. About 17 feet of gravel, composed largely of basaltic boulders, forming the top of the bluff.	
Total, about	687½

These shales rest on sandstones referred to the Dakota. In this district Dr. Peale estimates the total thickness of the shales belonging to the Fort Benton, Niobrara, and Fort Pierre at 1,500 to 2,000 feet.

A large part of Castle valley in eastern Utah is underlain by shales like those above described, and at a horizon in them about 1,000 feet below the Montana sandstones exposed to the Book Cliffs I have collected *Prionocyclus wyomingensis*, *Scaphites warreni*, *Baculites gracilis*?, and *Inoceramus dimidius*.

Farther south in western New Mexico and in Arizona, the sections described by Mr. G. K. Gilbert,² contain a greater proportion of sandstone, but the lower 850 feet, which is the only portion from which fossils were obtained, evidently belongs to the Colorado formation, and perhaps in the lowest layers to the Dakota. The highest fossiliferous horizon noted is at Stinking spring, near Fort Wingate, New Mexico, and it yielded *Inoceramus labiatus* and *Ammonites*.

¹ Ann. Rept. U. S. Geol. Sur. Terr. for 1874, p. 136.

² U. S. Geog. and Geol. Sur. West one hundredth meridian, vol. III, pp. 544, 549-554.

UTAH.

A portion of the Cretaceous in Utah has already been incidentally described, but two other areas in that territory require separate treatment on account of differences in both lithologic and paleontologic characteristics. One is the neighborhood of Coalville, in northern Utah, and in connection with it certain small areas in southwestern Wyoming may be conveniently discussed. The other is an irregular belt extending across the high plateaus of southern Utah, just south of the escarpment of the Pink cliffs.

In the area last mentioned several sections have been described by Messrs Gilbert¹ and Howell,² which show a tripartite division of the Cretaceous like that in the San Juan area with which it is geographically connected, but here the lower division of sandstones carries the principal coal beds, while the upper division has only thin seams. Other differences worthy of note are the occurrence of many marine fossils in the sandstones near the base of the Cretaceous and the more varied fauna of the lower part of the shales.

Some years ago Mr. C. D. Walcott measured a section in Kanab valley and made a considerable collection of Cretaceous fossils there. He has generously placed in my hands his unpublished notes on the Mesozoic portion of this section, and the description given below is based on these notes, supplemented by my own observations made during the summer of 1892, while studying the same section and a neighboring one in Long valley. The measurements are all Mr. Walcott's, but the detailed subdivisions are not given.

Cretaceous section of Upper Kanab valley.

	Feet.
1. Alternating beds of light-colored sandstones, clay shales, arenaceous shales, and coal, the sandstones constituting about one half of the entire thickness. At the base is a thin, irregular band of conglomerate and coarse sandstone resting on softer sandstones and shales that are provisionally referred to the Jurassic. Leaves and other plant remains occur about the middle of the division, and two zones near the top contain numbers of <i>Corbula nematophora</i> , <i>Cardium pauperculum</i> , <i>Modiola multilinigera</i> , <i>Glaucania coalvillensis</i> , a small <i>Ostrea</i> and an <i>Anomia</i> . Thickness.....	330
2. Arenaceous and clay shales, mostly of a drab color weathering into rounded hills and slopes of soft, more or less sandy clay. Near the base the shales are slightly bituminous and contain many limestone concretions, some of which are filled with well preserved fossils. (See list below.) Thickness.	885
3. Rather coarse friable sandstones of light colors (white, gray, and buff), alternating with thinner beds of gray, drab, and purplish arenaceous shales. The lower 50 feet is a massive yellow or buff sandstone, which is overlain by 50 to 60 feet of softer very fossiliferous sandstones, containing great numbers of <i>Ostrea soleniscus</i> , <i>Admetopsis</i> (an undescribed species), <i>Modiola multilinigera</i> ?, <i>Cyrena</i> , <i>Anomia</i> , and a few others, while the upper portion contains plant remains with <i>Unio holmesianus</i> , <i>Viviparus panguitchensis</i> , <i>Planorbis Physa</i> , etc., that seem to belong to the Laramie. Thickness..	1,700

¹ Op. cit., pp. 158-160.

² Ibid, pp. 270-280. Dutton's "Geology of the High Plateaus of Utah" and "Tertiary History of the Grand Cañon District" contain good general descriptions of the stratigraphy.

The coal beds of the lower division vary greatly, both in number and thickness, in sections only a few miles apart. The coal seems to be of inferior quality, but all of the few openings that have been made are small and have not gone beyond the influence of surface weathering. A mine at Glendale, in Long valley, on the uppermost coal bed, which is near the top of the division, shows about 8 feet of coal with two partings of indurated shale. One of these near the base of the bed is full of *Unios*, while the other about 3 feet above it contains great numbers of *Corbula nematophora*.

The fauna of this division so far as it is known is the same as that of the lower portion of the section at Coalville, Utah, and of the coal-bearing series along the western edge of the high plateau region near Cedar city and Kanarra, which will be considered on following pages.

The general aspect of the middle division is that of drab clay shales, though the upper part is more arenaceous and forms a transition to the sandstones above. The fossiliferous concretions seem to be confined to the lower 40 feet in Kanab valley, but near Mount Carmel in Long valley a few concretions containing *Buchiceras swallovi*, *Liopistha meeki*, and associated forms were found up to 325 feet above the base. This zone has yielded an interesting fauna containing some species not yet found elsewhere, with others that connect it with the Colorado fauna as developed in Huerfano park and in the Eagle Ford shales of Texas, as the following list of those collected in Upper Kanab valley will show:

<i>Gryphæa newberryi</i> .	<i>Lunatia concinna</i> .
<i>Lima utahensis</i> .	<i>Anchura?</i> <i>prolabiata</i> .
<i>Camptonectes platessa</i> .	<i>Anchura ruida</i> .
<i>Inoceramus fragilis</i> .	<i>Tritonium kanabense</i> .
<i>Nemodon sulcatus?</i> .	<i>Sigaretus textilis</i> .
<i>Lucina subundata</i> .	<i>Helicoceras pariense</i> .
<i>Liopistha meeki</i> .	<i>Baculites gracilis?</i>
<i>Liopistha elongata</i> .	<i>Buchiceras swallovi</i> .
<i>Corbula kanabensis</i> .	<i>Placentoceras</i> .
<i>Turritella whitei</i> .	<i>Acanthoceras kanabense</i> .

At a locality southeast of Paria, Utah, a number of the above species have been found in the same zone and associated with them *Inoceramus labiatus*, *Veniella goniophora*, and *Serpula intricata*.

This list of fossils contains enough characteristic species to furnish a good basis for correlation with the lower part of the Colorado formation, but with our present knowledge it is impossible to locate the upper limit of the formation in this section. It should probably be drawn below the base of the upper sandstone division.

The upper part, and probably almost the whole, of the third division has been correlated with the Laramie with a reasonable degree of certainty. The testimony of the fresh-water invertebrates and of the plants, though rather meager, is all favorable to such a correlation, and the fact that it is overlain by Eocene Tertiary beds without apparent

stratigraphic break also points in the same direction. The fossiliferous beds at the base, however, contain only marine- and brackish-water species, and unfortunately these do not furnish a good basis for correlation with any zone in other Cretaceous sections. There is a great abundance of fossils, but only a few species are represented and some of these are forms that have great vertical range, while the others have not been found outside of this district. The fauna as a whole has some resemblance to that of the upper coal horizon (the "third ridge") at Coalville, Utah, which, as will be shown farther on, is fully 1,800 feet below the top of the marine Cretaceous there, but this resemblance can not be accepted as proof of their contemporaneity. In Kanab valley the marine forms were not found more than 100 feet above the base of the sandstone, but in Long valley, only a few miles distant, they occur 100 feet higher. At the former locality fossil plants are abundant in a band of sandstone 275 feet above the top of the fossiliferous marine beds.

The sandstones above the basal massive bed have about the same character throughout. They are rather coarse, in a few instances becoming pebbly conglomerates, and often so friable as to form soft slopes that are easily mistaken for shale exposures. Many of these sandstones are large lenticular masses rather than continuous beds and nearly all of them vary greatly in thickness within short distances, a peculiarity that often makes it difficult to recognize individual beds in two neighboring exposures.

From the above remarks it will be seen that both the Montana and the Laramie formations are believed to be present above the Colorado, but the lower limit of each of them is still undetermined.

Before leaving the consideration of the Cretaceous in the high plateaus of Utah the differences shown on the western escarpment at Cedar city and Kanarra should be mentioned. At these places the equivalent of the lower coal-bearing division of the Kanab section has a much greater development and the other two divisions if present are concealed by a sheet of eruptive rock. At both localities the lower 300 or 400 feet consist of gray and brown sandstones and sandy shales in which no fossils were found excepting fragmentary remains of dicotyledonous plants. Then comes a band of fossiliferous gray shale 30 feet in thickness with a seam of coal at its base and a thicker coal bed above it. The fossils are *Ostrea soleniscus*, *Cardium pauperculum*, *Barbatia micronema*, *Corbula nematophora*, *Cyrena* —, *Admetopsis rhomboides*, *Eulimella funicula*, *Chemnitzia?* and in some layers *Unio*.

The coal bed immediately above varies in thickness from 6 to 10 feet at different openings. The overlying beds, of which about 350 feet are exposed at Kanarra and fully twice that thickness at Cedar city, consist of light gray and brown sandstones with some bands of shale. *Corbula nematophora*, *Ostrea soleniscus*, and *Admetopsis rhomboides* occur in great numbers at several horizons up to the top of the series.

Specimens of *Inoceramus labiatus* and *Avicula gastrodes* were found about 500 feet above the principal coal bed.

The greater thickness of the lower sandstone division here is an indication that the western border of the sea may have been near during Cretaceous time. Possibly a part of the shales of the Kanab middle division are here represented by sandstones, and the earlier fauna, thus finding a congenial habitat on the sandy bottom, may have survived much longer than it did a little farther east, where the subsidence was greater. If this supposition be granted it will explain the fact that most of the fossils in the uppermost marine bed of the Kanab section are closely related to species that occur 1,000 feet lower, although they are not found in the intervening strata. They have traveled across the area and back again as the shallow waters in which they lived shifted their place.

Cretaceous strata with coal beds and the same species of fossils as those above named in the shale below the coal are exposed in small outcrops among the eruptive rocks near Iron city, 20 miles west of Cedar, and they are known to occur on the same meridian farther south. No Cretaceous exposures are known to occur between this locality and the western slope of the Sierra Nevada.

The coal-bearing Cretaceous beds exposed at Coalville, Utah, and on Bear river, near the mouth of Sulphur creek, Wyoming, have been the subject of considerable discussion, and various opinions concerning their precise age have been published by the several geologists and paleontologists who have visited the localities or examined collections from them. They were referred to the Cretaceous by Messrs. Meek and Engelmann¹ in 1860 and were compared with certain Cretaceous beds at the mouth of Judith river, then regarded as belonging to No. 1 (Dakota) but afterward proved to be of Fox Hills age. When Capt. Simpson's report² was published in 1876 Mr. Engelmann again expressed the opinion that these beds are probably "Lower Cretaceous" [Dakota].

They were at first regarded as Tertiary by Messrs. Hayden³ and Lesquereux.⁴ In 1870 Messrs. Meek and Hayden⁵ adopted the view that the Coalville beds are Cretaceous but that they "occupy a higher horizon in the Cretaceous than even the Fox Hills beds of the Upper Missouri Cretaceous series."

Mr. Meek visited Coalville in 1872, and after making larger collections and studying the stratigraphy he decided that the entire Upper Missouri Cretaceous section with perhaps some older beds is represented here. The detailed section that he published⁶ shows correctly the essential features of the stratigraphy. The opinions that he then

¹ Proc. Acad. Nat. Sci. Phila., Vol. XII, p. 130.

² Exploration across the Great Basin of Utah in 1859, p. 291.

³ Ann. Rept. U. S. Geol. Sur. Terr. for 1869, p. 91.

⁴ Idem for 1873, pp. 366, 371.

⁵ Ann. Rept. U. S. Geol. Sur. Terr. for 1870, pp. 168, 291. Idem for 1871, p. 377.

⁶ Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 439.

expressed concerning the correlation of these beds were repeated in subsequent publications.¹

Messrs. King and Emmons² assigned the Cretaceous strata at Coalville to the Colorado, Fox Hills, and Laramie formations, and so mapped them in the atlas accompanying their report. The principal (lower) coal bed is included in the Colorado formation and upper one in the Fox Hills, the line between these two formations being drawn in the second ridge above the lower coal bed. It should be remembered that the Colorado formation was then made to include the Fort Pierre division.

Dr. C. A. White studied the section in 1877, and after discussing the fossils collected in it he states³ that it is impracticable to refer the strata to any one or more of the established Cretaceous groups with certainty, but he thinks there is no reason to doubt that the greater part of the series at least is referable to the Fox Hills.

The entire series at Coalville is characterized by heavy beds of light-gray and yellowish sandstones alternating with clay shales and other soft strata. Consequently, as the beds have a considerable dip, the sandstones form prominent ridges, and these were numbered in Prof. Meek's section, beginning with the first one above the lower coal bed. There are several faults in the area, one series nearly parallel with the strike and another almost at right angles with it, but they do not complicate the section greatly since the prominent sandstones are all fossiliferous and therefore easily identified. The following somewhat generalized description will serve to show the range of the fossils and the reasons for the correlation that follows:

Cretaceous section at Coalville, Utah.

	Feet.
1. Interstratified sandstones and shales, with heavy bed of coal at the top. The underlying beds are cut off by a fault. Several of the sandstone layers are very fossiliferous. (See list below.) Estimated thickness.	500-600
2. Gray sandstones 30 feet thick forming roof of coal bed, overlain by dark clay shales with numerous specimens of <i>Inoceramus labiatus</i>	795
3. Gray and yellowish hard sandstone forming the first and second ridges, with numerous fossils, many of which are identical with species of the Pugnellus sandstone in Huerfano park, Colorado. (See list below)...	100
4. Clays, with thin beds of sandstone.....	165
5. Massive conglomerate	60
6. Mostly covered, but showing soft clay shales and thin beds of coarse sandstone where exposed.....	845
7. Clay shales interstratified with thin bands of sandstone and two or three thin seams of coal (including the Carleton bed) of no economic importance, near the base. Fossils abundant, including marine, brackish and fresh water invertebrates, and plants. (See list below).....	110

¹ U. S. Geol. Sur. Terr. Vol. IX, p. xxx; U. S. Geol. Expl. Fortieth Parallel, Vol. IV, p. 11, footnote.

² U. S. Geol. Expl. Fortieth Parallel, Vol. I, pp. 316-319, 327-330, and Vol. II, pp. 330-337.

³ Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 239.

	Feet.
8. Massive gray and yellowish sandstone forming the third ridge, with <i>Ostrea soleniscus</i> , <i>Pholadomya subventricosa</i> (?), <i>Cardium</i> , and a few other marine Cretaceous species	200
9. Mostly covered, but evidently underlain by shales and soft sandstone. A band of sandstone about the middle of this member yielded specimens of <i>Mactra</i> , <i>Cardium</i> , and <i>Pecten</i> . Thickness about	1,500
10. Gray and brownish sandstone, with bands of shale. The upper 30 feet is a massive, irregularly bedded brownish sandstone with many specimens of <i>Inoceramus erectus</i> , <i>Cardium</i> , <i>Ostrea</i> , and a few other species mostly in the form of casts	150

The beds above this horizon are shown by the few exposures to consist of shales and beds of soft coarse sandstone with bands of conglomerate in the upper portion. I estimate that there is room for 1,500 feet of strata below the Tertiary Echo canyon conglomerate.

From No. 2 to No. 10, inclusive, the strata were measured by means of a clinometer compass in the manner described by Mr. C. D. Walcott.¹ The thicknesses given are therefore reasonably accurate, the principal source of error being the possible variations in dip within the long covered spaces.

The following species have been found in No. 1 of the section:

<i>Ostrea soleniscus</i> .	<i>Gyrodes depressa</i> .
<i>Modiola multilinigera</i> .	<i>Amauropsis coalvillensis</i> .
<i>Inoceramus labiatus</i> .	<i>Glaucania utahensis</i> .
<i>Barbatia micronema</i> .	<i>Turritella micronema</i> .
<i>Trigonarca obliqua</i> .	<i>Neritina pisum</i> .
<i>Cardium pauperculum</i> .	<i>Neritina patelliformis</i> .
<i>Mactra utahensis</i> .	<i>Chemnitzia coalvillensis</i> .
<i>Mactra emmonsii</i> .	<i>Eulimella funicula</i> .
<i>Parapholas sphenoides</i> .	<i>Admetopsis rhomboides</i> .
<i>Siliqua huerfanensis</i> .	<i>Admetopsis subfusiformis</i> .
<i>Corbula nematophora</i> .	<i>Fusus gabbi</i> .

No fossils have been found in the lower 300 feet of the section, and nearly all of those above enumerated occur in a zone from 100 to 150 feet below the principal coal bed. Several of the species are very abundant in certain layers of the sandstone.

The thin bed of sandstone immediately above the coal is usually barren of fossils. The only species that have been observed in it are *Ostrea soleniscus* and *Inoceramus labiatus*. The overlying thick bed of soft shales constituting the larger part of No. 2 is seldom seen in natural exposures but two or three shafts have been dug in it while prospecting for coal and the shales thus thrown out show large numbers of *Inoceramus labiatus*.

Certain bands in the heavy bedded sandstone of No. 3, especially near the top, are very fossiliferous. At Coalville this bed is repeated by a fault so that it forms the first and second ridges, but in addition to the structural evidence of the presence of a fault the fossils plainly show the repetition. On Grass creek, about 4 miles from Coalville, this

¹Proc. U. S. National Museum, Vol. XI, 1888, p. 447.

part of the series is unbroken. This horizon has yielded the following species of fossils:

<i>Gervillia propleura.</i>	<i>Corbula nematophora.</i>
<i>Cardium pauperculum.</i>	<i>Gyrodes depressa.</i>
<i>Tapes cyprimeriformis?</i>	<i>Turritella micronema.</i>
<i>Donax oblonga.</i>	<i>Pugnellus fusiformis.</i>
<i>Tellina? isonema.</i>	<i>Fasciolaria? utahensis.</i>
<i>Tellina modesta.</i>	<i>Pyropsis —.</i>
<i>Mactra emmonsi.</i>	<i>Prionotropis hyatti?</i>
<i>Anatina lineata?</i>	<i>Placenticeras —.</i>

On East Canon creek below Parley's park, about 12 miles southwest of Coalville, there are Cretaceous outcrops in which few of the individual beds of the Coalville section can be recognized, but this sandstone (No. 3) is present and easily recognized by its fossils, of which it has yielded the following species:

<i>Trigonarca obliqua.</i>	<i>Mactra emmonsi.</i>
<i>Cardium pauperculum.</i>	<i>Pugnellus fusiformis.</i>
<i>Tellina? isonema.</i>	<i>Baculites gracilis?</i>
<i>Tellina? subalata.</i>	<i>Prionotropis.</i>
<i>Mactra utahensis.</i>	

This outcrop was mapped by the Fortieth Parallel Survey as very near the boundary between the Cretaceous and the Tertiary, but it is at least possible that the heavy bed of coarse conglomerate 275 feet above it and in the same conformable series also belongs to the Cretaceous and simply represents a greater local development of the conglomerate No. 5 of the Coalville section.

The lists of fossils just given clearly show that a single fauna ranges from near the base of the section at least to the top of No. 3, through over a thousand feet of strata. It is true that certain species seem to be confined to particular strata, but other species, and among them some of the most characteristic ones, such as *Inoceramus labiatus*, range through nearly the whole thickness and each zone is connected with the others by interlocking species. The lists also show that certain of these zones are represented in other sections already described. For example, No. 1 contains about all of the species that were found in the lower division of the Upper Kanab section and in the coal-bearing beds near Cedar city and Kanarra, and these strata may be regarded as equivalent. Again, the faunal lists from No. 3 and from the *Pugnellus* sandstone in Huerfano park, Colorado, have so many species in common that there can be little doubt that these beds are very nearly contemporaneous deposits.

Up to this horizon the Coalville section very clearly belongs to the Colorado formation¹ and apparently represents almost the whole of it as developed elsewhere. In Colorado there is never more than 300 to 400 feet of the Niobrara beds above the horizon of the *Pugnellus* sandstone. Still it is well to remember that the Niobrara consists largely

¹ The word "formation" is here used in a somewhat loose sense for want of a better term to designate a series of strata containing a single fauna.

of calcareous deposits which may be represented elsewhere by a much greater thickness of shales and sandstones. Provisionally I have taken the base of the conglomerate No. 5 as the top of the Colorado formation at this locality. The soft strata of No. 6 are seldom exposed in the Coalville area and no fossils have been found in them, but they appear to belong with No. 7.

The overlying 1,800 feet of shales and sandstones are fossiliferous at several horizons, but their strict paleontologic correlation with Cretaceous formations of other regions is difficult for several reasons. In the first place several of the most abundant and best preserved species are not known to occur in well defined formations elsewhere. Others again belong to types that are known to have a great vertical distribution and many are not sufficiently well preserved to admit of positive specific determination. And finally, after allowance has been made for all these defects, the evidence seems to be conflicting. Stratigraphically it is evident that these beds hold the position of the Montana formation, but whether they should all be referred to that formation or part of them should be regarded as the time equivalent of the Laramie must still be left an open question. It is a question that may have an important bearing on the more general problem of the condition of the continent during the Laramie epoch. A very promising field for the study of this question is in western Wyoming along the uplift of "Oyster ridge" and west of it, where at least a part of these upper beds and the horizon of the Evanston coal are both represented in the same neighborhood.

Before giving the lists of fossils from these upper beds I will state that there is no doubt concerning their relative positions. The sandstones of No. 8, dipping 20° to 25° , form a nearly vertical escarpment beneath which the softer beds of No. 7 are exposed in a steep bare slope showing in some places almost every layer. The lower 25 feet of No. 7 exposed beneath the coal bed yielded:

<i>Ostrea coalvillensis.</i>	<i>Corbula subtrigonalis?</i>
<i>Anomia propatoris.</i>	<i>Cardium.</i>
<i>Modiola multilinigera?</i>	<i>Barbatia.</i>

The clay shales immediately associated with the coal seams contain large numbers of fossils in which fresh water, brackish water, and marine forms are commingled. The following list includes those recorded by Prof. Meek from the old Carleton coal mine, nearly all of which have been collected by myself at another exposure on the opposite side of the Weber river, and about 3 miles distant:

<i>Modiola multilinigera?</i>	<i>Neritina bannisteri.</i>
<i>Anomia propatoris.</i>	<i>Eulimella? chrysallis.</i>
<i>Cyrena carletoni.</i>	<i>Eulimella? inconspicua.</i>
<i>Unio.</i>	<i>Melampus antiquus.</i>
<i>Turritella spironema.</i>	<i>Valvata nana.</i>
<i>Neritina bellatula.</i>	<i>Physa carletoni.</i>
<i>Neritina carditoides.</i>	

For about 50 feet above the coal seams the following species are found, the most of them in abundance:

<i>Ostrea coalvillensis.</i>	<i>Eulimella chrysallis.</i>
<i>Anomia propatoris.</i>	<i>Admetopsis.</i>
<i>Corbula subtrigonalis?</i>	<i>Chemnitzia?</i>
<i>Cyrena</i> or <i>Corbicula.</i>	<i>Melania.</i>
<i>Avicula.</i>	

Four feet below the highest band in which these species were found there is a layer of sandstone containing plant remains. They were very abundant and fairly well preserved at one small outcrop where a collection was made. Plants also occur sparingly in other bands of sandstone above this and in the massive sandstones of No. 8. The plants have been examined by Mr. F. H. Knowlton, of the Geological Survey, and in his notes on them he says:

The matrix, a hard, fine-grained brownish sandstone, preserves the outlines and coarse nervation of the plant remains very satisfactorily, but does not well retain the fine nervation. A number of the species, however, are so characteristic that there can be little doubt as to their determination.

The collection consists of thirty-five specimens representing about twelve species, the most important of which belong clearly to the Laramie group. They are as follows:

* <i>Sequoia longifolia</i> Lx.	<i>Ficus planicostata</i> ? Lx.
<i>Sequoia reichenbachii</i> Heer.	* <i>Ficus irregularis</i> ? Lx.
<i>Glyptostrobus europaeus</i> ? Heer.	* <i>Viburnum marginatum</i> Lx.
<i>Salix elongata</i> O. Web.	<i>Viburnum</i> sp.
<i>Salix integra</i> Göpp.	* <i>Cinnamomum affine</i> Lx.
<i>Salix</i> sp.	* <i>Magnolia tenuinervis</i> Lx.
<i>Ficus lanceolata</i> Heer.	

Those marked with an asterisk in the above list are, according to Mr. Knowlton, "Laramie species about which there is little doubt as to their correct determination." The others are "either fragmentary and therefore of doubtful determination, or occurring in formations other than the Laramie." Only one species in the list, *Sequoia reichenbachii*, is known to occur below the Laramie and it has a wide range, being found from the Jurassic or Lower Cretaceous to the Tertiary.

If the evidence of these plants were considered alone there could be no hesitation in referring the strata containing them to the Laramie. Some of the invertebrates also from No. 7 are very closely related to Laramie species if not identical with them, but unfortunately the most of them are of types that have a great vertical range and therefore are of little use in correlation. *Ostrea coalvillensis* is probably identical with *O. glabra*. *Corbula subtrigonalis* is a Laramie species, but closely similar forms occur in the Colorado. *Anomia propatoris* also is represented in both of these formations by closely similar or identical forms. *Modiola multilinigera* is a Colorado species and it has near relatives in the Laramie. The form listed as *Melania* seems to be very close to *Melania wyomingensis*, a species that has been considered characteristic of the

Laramie, though it does occur associated with marine forms in the uppermost Fox hills beds. The *Admetopsis* is apparently the same species that occurs so abundantly with *Ostrea soleniscus*, *Modiola multilinigera*?, etc., near the base of the upper division of the Upper Kanab section. The species of *Neritina* belong to types that range from the Colorado to the Laramie. In fact none of the brackish-water species of these lists would be thought out of place if they were found in the Laramie. But when it is known that the beds containing them are overlain by 1,800 feet of marine Cretaceous strata their Laramie age is rendered very doubtful. In many respects the facts observed recall the Belly River series of the Canadian geologists, but at Coalville the brackish-water conditions seem to have been too limited both in area and duration to be regarded as more than a temporary phase—perhaps an estuary—in a marine formation.

Twenty feet above the bed from which the plants were obtained and in the same exposure a thin layer of sandstone is filled with the remains of marine invertebrates mostly in the form of casts. The following species have been collected from it:

<i>Cardium curtum</i> .	<i>Gyrodus</i> .
<i>Cardium n. sp.</i>	<i>Pyropsis</i> .
<i>Mactra arenaria</i> .	<i>Fusus</i> .
<i>Mactra formosa</i> ?	<i>Baculites ovatus</i> ?
<i>Tellina isonema</i> ?	<i>Placenticeras placenta</i> var.
<i>Donax cuneata</i> ?	<i>intercalare</i> .
<i>Barbatia</i> .	<i>Scaphites</i> .
<i>Anatina</i> .	

The most abundant and best preserved species are *Cardium curtum* and *Mactra arenaria*, neither of which has been found elsewhere than in this immediate region or in the strictly equivalent strata of western Wyoming. Of the others the bivalves and the gasteropods are of doubtful value, and the cephalopods apparently belong to the fauna of the Montana formation, though the *Placenticeras* also occurs in the Colorado formation.

The more massive sandstones of No. 8 have yielded—

<i>Ostrea soleniscus</i> .	<i>Cardium</i> .
<i>Ostrea sannionis</i> .	<i>Donax</i> ?
<i>Tellina subalata</i> ?	<i>Baculites ovatus</i> .
<i>Mactra formosa</i> ?	<i>Placenticeras placenta</i> , var.
<i>Mactra arenaria</i> .	<i>intercalare</i> .
<i>Pholadomya subventricosa</i> .	

It has already been shown that marine Cretaceous fossils have been found at two other horizons above this, one near the middle of No. 9 and the other in No. 10, and they all belong to the fauna represented in the last two lists.

After attempting to give due weight to each element in this conflicting evidence it seems to me most reasonable to refer the strata containing the "Laramie" plants and the brackish-water invertebrates of

Laramie affinities to the Montana formation. If the true Laramie is present it is represented by the strata above No. 10 of the section and these have yielded no fossils.

The beds beneath the Coalville section are not exposed in the immediate neighborhood, but near Rockport, on the Weber river, 12 miles above Coalville, the continuation of the section down to the Trias may be seen. The strata are highly disturbed, dipping northward at angles varying from 30° to 80° . There are at least two faults in the series, and the great apparent thickness of the section suggests that there may be others by which strata are repeated.

The lowest fossiliferous zone of the Coalville section with the characteristic species, such as *Barbatia micronema*, *Mactra utahensis*, *Modiola multilinigera*, and others, is well developed. Beneath (south of) this bed there are no good exposures for a distance of 2,200 feet. Then come the following strata in descending order:

	Feet
1. Alternating beds of coarse sandstone and shale. The beds of sandstone vary in thickness from 10 feet to over 100 feet, and their aggregate thickness is somewhat less than that of the shales. A few specimens of <i>Ostrea</i> and casts of <i>Cardium</i> and other bivalves were found in the lower portions. Total apparent thickness	2,500
2. Drab shales with indurated bands in which numerous scales of fishes and an obscure impression of an Ammonite were collected.....	215
3. Covered for a distance of	700
4. Reddish and brownish shales alternating with thinner beds of coarse gray sandstone, changing to brown pebbly conglomerate in the lower 650 feet.	2,400
5. Reddish shales with thin beds of brown sandstone	433
6. Dark greenish gray sandstone, somewhat calcareous, especially toward the top. A specimen of <i>Trigonia quadrangularis</i> ? and a few other obscure fossils indicate that this bed is Jurassic.....	55
7. Gray and reddish sandy shales, with bands of sandstone.....	1,295
8. Yellowish gray shales, becoming calcareous toward the base.....	935
9. Blue thin bedded limestone and calcareous shales containing <i>Pentacrinus asteriscus</i> , <i>Pleuromya subcompressa</i> , and other Jurassic fossils.....	422
10. Reddish brown thin bedded Triassic? sandstone, exposed.....	750

The thicknesses given are from measurements made on the assumption that there is no duplication of strata by faulting. The observed faults that have been mentioned are not within the limits of the section. If the beds down to and including No. 4 be regarded as Cretaceous, this gives an apparent thickness of over 6,000 feet of Cretaceous strata beneath the Coalville section. On East Canyon creek below Parley's park the thickness from the base of the conglomerates, like those of No. 4, to the top of the fossiliferous sandstone there exposed seemed to be a little over 5,000 feet, but that was only an estimate based on observed dips and paced distances.

The conglomerates of No. 4 were mapped as Dakota by Mr. Emmons, and the two other "Dakota" areas that I have visited in this region—one on East Canyon creek and the other on Chalk creek—show the same beds. That they are Cretaceous is very probable, but that they

should be strictly correlated with the Dakota sandstone east of the Rocky mountains seems to me doubtful.

In a previous paper¹ already cited, I have shown that in western Wyoming the brackish water Bear River formation, formerly called the Bear River Laramie, is beneath the Colorado, and that it rests on just such a series of shales, sandstones, and conglomerates as is included in No. 4 of the Rockport section. The nearest locality at which Bear River fossils have been found is the well known one on the Union Pacific railroad near the mouth of Sulphur creek, which is about 40 miles from Rockport. The lowest strata there exposed are the upper part of the Jurassic.

The detailed sections as seen in various exposures in the immediate neighborhood of Sulphur creek may be thus epitomized in ascending order:

	Feet.
1. Reddish brown, and bluish shales and shaly sandstones with a thin calcareous band about the middle containing <i>Belemnites densus</i> , <i>Trigonia quadrangularis</i> , and <i>Pleuromya weberensis</i> . Thickness about.....	500
2. A heavy bed of brown pebbly conglomerate forming the base of a series of alternating coarse sandstones, and variegated shales that was doubtfully referred to the Dakota. Total thickness	1,600
3. Very fossiliferous dark calcareous shales with a few thin beds of sandstone. Fossils: <i>Pyrgulifera humerosa</i> , <i>Corbicula durkeei</i> , <i>Unio vetustus</i> , <i>Corbula pyriformis</i> , etc.....	840
4. Blue and brownish fissile shales with many scales of fishes, a few fragments of Ammonites and, at a higher horizon, numerous specimens of <i>Cardium pauperculum</i> . Some beds of sandstone are probably included. Thickness estimated.....	1,000-1,500
5. At a higher horizon, the exact position of which could not be determined in the local sections on account of faults, a sandstone accompanying a coal bed yielded <i>Inoceramus labiatus</i> , <i>Corbula subtrigonalis</i> ?, <i>Donax cuneata</i> , <i>Pugnellus fusiformis</i> , <i>Ostrea soleniscus</i> , and other species that permit its correlation with No. 4 of the Coalville section. There are also higher beds exposed here, but owing to the complicated structure the upper part of the section has not been worked out.	

No. 1 is Jurassic, and it is comparable with Nos. 5 and 6 of the Rockport section.

No. 2 is very much like No. 4 of the Rockport section. The conglomerate at the base is of the same character at both places, though near Sulphur creek it reaches a thickness of 150 feet, while at Rockport it is broken up into several thinner beds, the thickest of which is about 50 feet.

No. 3 is the Bear River formation with its characteristic fossils here ranging through only 650 feet of strata, but at other localities farther north the fossils were found to range through a thickness of at least 2,500 feet, extending down almost to the conglomerate at the base of No. 2. The failure to find Bear River fossils at Rockport and in East canyon may be due to the incomplete exposures of strata there, as the por-

¹Am. Jour. Sci., vol. XLIII, 1892, pp. 98-115.

tions of the section in which they were expected were much covered with *débris*, but it is quite probable that the fresh and brackish waters in which they flourished did not extend as far south and west as these localities. At any rate, the formation has not been found beyond them in those directions. Although the Bear River formation as such seemed to be absent, nevertheless its position in the Rockport section is plainly indicated by the indirect circumstantial evidence of a similar succession of strata and of apparently identical underlying and overlying beds to be about that of the covered space No. 3 and the upper part of No. 4.

The lower part of the shales overlying the Bear River formation on Sulphur creek are in every respect similar to No. 2 of the Rockport section. In the earlier paper they were referred to the Colorado formation, and they seem to be faunally connected with it, but their position is now seen to be considerably lower than I then suspected, though, owing to the doubt concerning the number of faults in the Rockport section, I am still unable to say how many hundred feet they are below the base of the Coalville section. The very great thickness of strata between the top of the Colorado formation at Coalville and the base of the so-called Dakota conglomerates (it can hardly be less than 5,000 or 6,000 feet) causes me to suspect that the latter are somewhat older than the Dakota sandstone as developed east of the Rocky mountains. After making such allowance for differences in the rate of deposition as the character of the strata will permit and assuming that sedimentation was continuous in both regions, as seems to have been the case, the 1,000 or 1,200 feet of strata in the one region can hardly be regarded as the complete equivalent of 5,000 or 6,000 feet in the other.

From the foregoing descriptions of local sections it is seen that in the larger part of the area the Colorado formation rests with apparent conformability on the Dakota sandstone; that in southern Utah its fauna ranges down to the local base of the Upper Cretaceous and through beds that have usually been correlated with the Dakota, and that in southwestern Wyoming it rests on the Bear River formation, with which it seems to be conformable. It is also shown that the Colorado formation is overlain by the Montana formation with a distinct marine Cretaceous fauna. With the exception of the two or three instances noted no nonconformity has been observed between these two formations.

The accompanying faunal lists show the geographical distribution of nearly all the species and their vertical range within the area here discussed, and they also show the reasons for correlating the different sections.

A more general consideration of the fauna as a whole in its relations to other Cretaceous faunas in this country and in Europe will now be given briefly.

THE RELATIONS OF THE COLORADO FAUNA TO OTHER CRETACEOUS FAUNAS.

Within the geographic limits arbitrarily assigned to the Colorado formation in the early part of this paper there is only one other marine Upper Cretaceous fauna—that of the Montana formation, which immediately overlies it. The larger part of it was described and illustrated by Prof. Meek in his volume on Invertebrate Paleontology,¹ and many additional species have been described by Dr. White, Prof. Whitfield, and others. A comparison of these two successive faunas shows that they are remarkably distinct although, as should be expected, they have some species in common and others that are very closely related. The species that are considered identical nearly all belong to genera whose species are seldom sufficiently differentiated to be depended upon in close geologic correlation. Those that seem to have passed up from the Colorado to the Montana formation are not usually found associated with the typical Montana fauna, but the most of them occur in that peculiar phase of it that was developed along the western shore line.

In the following list of common and closely related species in the two formations the interrogation after a name indicates a doubt as to the identity of closely related forms:

Colorado formation.	Montana formation.
<i>Ostrea soleniscus.</i>	<i>O. soleniscus.</i>
<i>Ostrea prudentia.</i>	<i>O. patina.</i>
<i>Anomia propatoris?</i>	<i>A. propatoris.</i>
<i>Modiola multilinigera.</i>	<i>M. multilinigera?</i>
<i>Inoceramus simpsoni.</i>	<i>I. simpsoni.</i>
<i>Barbatia micronema.</i>	<i>B. micronema?</i>
<i>Nemodon sulcatus.</i>	<i>N. sulcatus.</i>
<i>Lucina subundata.</i>	<i>L. subundata.</i>
<i>Veniella mortoni.</i>	<i>V. humilis.</i>
<i>Anatina lineata.</i>	<i>A. lineata?</i>
<i>Corbula subtrigonalis.</i>	<i>C. subtrigonalis.</i>
<i>Lunatia concinna?</i>	<i>L. concinna.</i>
<i>Baculites asper.</i>	<i>B. asper?</i>
<i>Placentoceras placenta.</i>	<i>P. placenta.</i>

In addition to these the species of *Neritina*, *Eulimella*, *Chemnitzia*, and *Admetopsis*, occurring in the Colorado formation in Utah, belong to types that are also found in the higher beds of the same region.

If we now compare the Colorado fauna with the fauna of the Ripley formation of the southern United States, which is believed to be the equivalent of the Montana formation, some additional resemblances are seen. For example, the genera *Trigonarca*, *Gyrodes*, *Rostellites*, and *Pugnellus* are present in both, and the first two are represented by similar species, but none of the forms that can be considered characteristic of the Colorado fauna are known in any of the more recent faunas.

Before comparing our fauna with others believed to have been con-

¹U. S. Geol. Surv. Terr., Vol. ix, Pls. 10-39.

temporaneous, it may be well to enumerate some of its most characteristic forms. Those given in the following list are not known to range into strata above the Colorado formation and all are sufficiently abundant and widespread to be of use in correlation. Many others are equally as characteristic, but have been found at only one or two localities:

<i>Ostrea lugubris.</i>	<i>Cardium pauperculum.</i>
<i>Exogyra columbella.</i>	<i>Liopistha (Psilomya) meeki.</i>
<i>Gryphæa newberryi.</i>	<i>Liopistha (Psilomya) concentrica.</i>
<i>Avicula gastroides.</i>	<i>Turritella whitei.</i>
<i>Gervillia propleura.</i>	<i>Glaucania coalvillensis.</i>
<i>Inoceramus labiatus.</i>	<i>Pugnellus fusiformis.</i>
<i>I. dimidiatus.</i>	<i>Baculites gracilis.</i>
<i>I. fragilis.</i>	<i>Buchiceras swallowi.</i>
<i>I. umbonatus.</i>	<i>Scaphites warreni.</i>
<i>I. exogyroides.</i>	<i>Prionocyclus.</i>
<i>I. deformis.</i>	<i>Prionotropis.</i>
<i>I. undabundus.</i>	<i>Mortoniceras.</i>

None of the keeled Ammonites included in the last three genera above named have been found above the limits of the Colorado formation and its equivalents in America.

The fauna is also negatively characterized by the absence of many types that form prominent features of the Montana fauna. Among such may be mentioned the genera *Heteroceras*, *Ptychoceras*, and *Anisomyon*, the large species of *Baculites*, such as *B. ovatus*, *grandis*, and *compressus*, *Scaphites conradi* and *Scaphites nodosus*, and the broad compressed forms of *Inoceramus*, like *I. sagensis* and *I. vanuxemi*.

The Eagle ford shales and the Austin limestone of Texas have already been alluded to as the equivalents of the Fort Benton and Niobrara, respectively. This correlation was made on a good paleontological basis by Shumard, Meek, White, and others, and it has never been questioned. The faunal lists published by Mr. R. T. Hill¹ contain the following species that occur in the Colorado formation or are represented by closely related forms:

From the Eagle Ford shales.

<i>Ostrea congesta.</i>	<i>Buchiceras swallowi.</i>
<i>O. bellaplicata [lugubris.]</i>	<i>Mortoniceras shoshonense.</i>
<i>Exogyra columbella.</i>	<i>Prionotropis woolgari.</i>
<i>Inoceramus exogyroides.</i>	<i>Ancyloceras? annulatus.</i>
<i>I. involutus [umbonatus.]</i>	<i>Ammonites graysonensis.</i> ²
<i>I. labiatus.</i>	<i>Ammonites meekianus.</i> ²

From the Austin limestone.

<i>Ostrea congesta.</i>	<i>I. labiatus.</i>
<i>Exogyra columbella.</i>	<i>Trigonarca sp.</i>
<i>E. læviuscula.</i>	<i>Nautilus elegans.</i>
<i>E. ponderosa.</i>	<i>Mortoniceras vespertinum</i>
<i>Inoceramus exogyroides.</i>	(=Amm. texanus).
<i>I. involutus.</i>	<i>Mortoniceras shoshonense.</i>
<i>I. umbonatus.</i>	<i>Baculites asper.</i>

¹ Geol. Sur. Tex. Bull. No. 4, Check List, Cret. Invert. Foss. of Tex., pp. 51-53.

² These probably are species of *Prionotropis*.

Associated with these is a large number of other species that have not been recognized in our area. The fauna of the Austin limestone seems to be somewhat more closely related to that of the overlying beds than is the Colorado fauna to the Montana.

Some of the species doubtfully assigned to the Eagle Ford shales are also listed as occurring in the Denison beds at the top of the Comanche series, but this is probably an error, since the species in question are entirely Upper Cretaceous forms and several of them occur in the Colorado formation.

Beneath the Eagle Ford shales the Timber Creek formation (Lower Cross Timber sands of Hill) contains an unstudied marine fauna that will probably prove to be closely related to the Colorado fauna, especially to that part of it that occurs in the lower portion of the formation in Utah.¹

The Upper Cretaceous faunas of Mexico have not been studied, but the occurrence of *Inoceramus labiatus* at several localities in Chihuahua indicates the presence of the Colorado fauna there, though Dr. White has suggested that the Upper Cretaceous strata of that region are not divisible into distinct formations.

The Colorado fauna has not been recognized in any of the states east of the Mississippi. If it is represented at all in the Alabama-Mississippi region it should be sought in the Tombigbee sands and the Eutaw formation and perhaps the lower part of the "Rotten Limestone," none of which has been much studied paleontologically.

On the Pacific coast of the United States the Cretaceous faunas generally are very different from those occurring east of the mountains, having few if any species in common. None of the characteristic Colorado species has been found there, and it has not yet been determined whether any of the Cretaceous formations of California, Oregon, and Washington are strictly the equivalents of the Colorado formation. Farther north, however, in the upper shales and sandstones of the Queen Charlotte islands *Inoceramus labiatus* is reported² to occur, and this may be considered the most characteristic species of the Colorado fauna.

In the Rocky mountain region of British America, Dr. G. M. Dawson³ obtained the following species that clearly belong to our fauna:

Ostrea congesta.

Inoceramus exogyroides.

I. undabundus.

I. labiatus.

Pholadomya papyracea.

Scaphites warreni.

S. vermiformis?

From the "Niobrara-Benton formation" in the Duck and Riding mountain district of Manitoba, Mr. Whiteaves⁴ records the following species:

Serpula semicoalita.

Lingula subspatulata?

Ostrea congesta.

Anomia obliqua.

Inoceramus labiatus.

Modiola tenuisculpta.

Belemnitella manitobensis.

Loricula canadensis.

¹ Vide White, C. A., Bull. 82, U. S. Geol. Sur., p. 121.

² Whiteaves, J. F.: Mesozoic fossils, Vol. 1, p. 193.

³ Whiteaves, Cont. to Can. Palæont., Vol. I, pp. 83-86.

⁴ Ibid., pp. 185-191.

In several of their joint papers Messrs. Meek and Hayden suggested the correlation of the "lower series" of their section with the Lower or Gray Chalk of the English geologists. In 1861 they stated their views¹ thus:

Having now considered, in the order of their succession, the several rocks embraced in the lower series of the Nebraska cretaceous deposits * * * it will be interesting to see how nearly their synchronism with known horizons in the Cretaceous system of the old world can be traced out. With this view we have carefully compared with European forms all the fossils in the several Nebraska collections from the rocks, including those most recently obtained, to which the new species described in this paper belong. These comparisons have satisfied us that the formations under consideration, that is, the Niobrara division, Fort Benton group, and the Dakota group represent together the Lower or Gray Chalk, and probably the Upper Greensand of British geologists (Turonien and Cenomanien of d'Orbigny).

Seven identical or closely related species are listed as occurring in both the American and the foreign formations. In Prof. Meek's latest work, so frequently cited, this correlation is again maintained and based on the same evidence. At that time less than twenty-five species were known to belong to the Colorado fauna.

A comparison of the much greater number of the species now known with those of the European Turonian in the light of more definite statements concerning the vertical range of European species as given by Barrois,² Schlüter,³ Zittel,⁴ and others furnishes additional evidence mainly in the same direction. The following comparative lists contain the most prominent examples of identity or close similarity:

From the Colorado formation.

Nautilus elegans.
Scaphites warreni. }
Scaphites larvæformis. }

Exogyra suborbiculata.
Anomia subquadrata.
Avicula gastroides.
Inoceramus labiatus.
Inoceramus deformis.
Amauropsis bulbiformis.
Rostellites dalli.
Baculites gracilis.
Prionotropis woolgari.
Prionotropis lævianus.
Prionocyclus wyomingensis.

From the Cenomanian.

Nautilus elegans.

Scaphites æqualis.

From the Turonian.

Exogyra suborbiculata.
Anomia truncata.
Avicula caudigera.
Inoceramus labiatus.
Inoceramus cuvieri.
Amauropsis bulbiformis.
Rostellites elongata.
Baculites bohemicus.
{ *Prionotropis carolinus.*
{ *Prionotropis woolgari.*
Ammonites nodosoides.
Ammonites germari.

In Germany Dr. C. Schlüter has described, under the name "Em-scher Mergel," a formation overlying the Turonian which he regards as intermediate between that formation and the Senonian, though it has

¹ Proc. Acad. Nat. Sci. Phila., 1861, p. 423.

² Barrois, C.: Terrain Crétacé de l'Angleterre, Lille, 1876.

³ Schlüter, C.: Cephalopoden der oberen deutschen Kreide, Palæontographica, Vol. xxiv, 1876, pp. 87-134.

⁴ Zittel, K. von.: Handbuch der Palæontologie.

usually been placed at the base of the Senonian. It is especially characterized by the keeled *Ammonites*, such as those we have referred to *Mortoniceras* and *Prionocyclus* and by certain forms of *Inoceramus*. Several species are represented by identical or closely related American forms, as follows:

From the Colorado formation.	From the Emscher Mergel.
<i>Inoceramus umbonatus</i> . }	Represented by <i>Inoceramus involutus</i> .
<i>Inoceramus exogyroides</i> . }	
<i>Inoceramus deformis</i> .	<i>Inoceramus cuvieri</i> .
<i>Baculites asper</i> .	<i>Baculites incurvatus</i> .
<i>Mortoniceras shoshonense</i> .	<i>Mortoniceras vespertinum</i> .

On account of the occurrence of these forms and a few others in Texas, Dr. Schlüter¹ has considered the beds (Austin limestone) containing them the equivalent of the Emscher Mergel.

It is interesting to compare these facts with the evidence furnished by vertebrate fossils from the Colorado formation. I can not do this better than by quoting the statements of Prof. E. D. Cope:²

The fauna of the deep sea epoch, the Niobrara, is the best known. Here the remains of *Pythonomorpha* constitutes the prevailing characteristic, while *Elasmosaurus* and *Polycotylus*, with but few species, represent the numerous *Sauropterigia* of Europe. Crocodiles were apparently wanting, while turtles and a peculiar group of *Pterosauria* were only moderately abundant. The fish fauna was very rich and varied. Here the *Saurodontidæ*, like the molluscous family of the *Rudistæ*, appeared and as soon disappeared, accompanied by the peculiar form *Erisicthe* and the family of *Stratodontidæ*. The genera of Mount Lebanon, *Leptobrachelus* and *Spaniodon* occur in this bed in Dakota, but the closest parallelism is exhibited with the Lower Chalk or Turonian of western Europe. The general facies of the reptilian fauna is that of the Lower Chalk, and there is little doubt that several genera are identical in the two continents, e. g., *Elasmosaurus*. The apparent peculiarity of the Chalk in America is the abundance (four genera) of *Pythonomorpha*, with numerous species, while but two genera have yet been found in Europe, and the presence of birds with biconcave vertebræ and teeth. This interesting type, which was first discovered by Seeley in the genus named by him *Enaliornis*, and afterwards found by Marsh to have teeth, has been found at a lower horizon in England, the Upper Greensand. But in England, France, and Westphalia occur the genera of fishes above mentioned, as, *Porthenus*, *Ichthyodectes*, *Saurodon*, *Saurocephalus*, *Erisicthe*, *Empo*, *Pachyrhizodus*, *Enchodus*, *Leptotrachelus*, etc. This close relationship of the horizons permits an identification, and it is the first instance that appears to me susceptible of satisfactory demonstration.

Again, on page 42 in "Resume of Comparisons," he says: "Exact identification of restricted divisions may be made in a few instances only, such as the Turonian and the Niobrara."

Sufficient evidence has been given to show that the invertebrate fauna of the Colorado formation can not be divided into well defined sub-faunas or zones corresponding to those that have been recognized in Europe. It is true that certain types seem to be confined to the upper part and others to the lower part of the formation, but some of the most

¹Op. cit., p. 113, and Naturh. Ver. pr. Rheinl. Sitzungsb. Jahrg. 44, 1887, p. 47.

²Cope, E. D.: Cretaceous Vertebrata. U. S. Geol. Sur. Terr., vol. III, pp. 27, 28.

characteristic species, such as *Inoceramus labiatus*, range from the bottom to the top. The fauna as a whole may be regarded as the approximate taxonomic equivalent of the Turonian, though it is not probable that either the beginning or the end of the epoch was contemporaneous on the two continents. The few species that are compared with Cenomanian forms are not important. One of them, *Nautilus elegans*, occurs in the upper part of the Colorado formation (at least in Texas), while the *Scaphites* are associated with *Inoceramus labiatus*, *Prionotropis woolgari*, and *Prionocyclus wyomingensis* in the Fort Benton shales.

The indefiniteness of the correlation of the upper part of the formation—the Niobrara and its equivalent, the Austin limestone—is shown by the facts above given, the vertebrates belonging to the Turonian types, while the mollusks may be compared in part with Emscher or lowest Senonian forms. As usual when an attempt is made to identify formations in such widely separated regions, the identification is most certain when only one class of facts is examined, and becomes doubtful when the facts are more numerous and are gathered from more varied sources.

DESCRIPTION OF SPECIES.

ECHINODERMATA.

CRINOIDEA.

UINTACRINIDÆ.

Genus UINTACRINUS Grinnell.

UINTACRINUS SOCIALIS Grinnell.

Uintacrinus socialis Grinnell, 1876, Am. Jour. Sci., vol. XII, p. 81; Meek, 1876, Bull. U. S. Geol. Sur. Terr., vol. II, p. 375; Clark, 1893, Bull. U. S. Geol. Sur., No. 97, p. 21, Pl. 1, Figs. 1a-c, and Pl. 2, Figs. 1a-e.

This species and the following one having been recently described and illustrated in a publication of the U. S. Geological Survey, are listed here simply with references for the sake of completeness.

ECHINOIDEA.

CASSIDULIDÆ.

Genus CASSIDULUS Lamarck.

CASSIDULUS STANTONI Clark.

Cassidulus stantoni Clark, 1891, Johns Hopkins University Circulars, No. 87, p. 76; 1892, Bull. U. S. Geol. Survey, No. 97, p. 73, Pl. 35, Figs. 2a-d.

VERMES.

SERPULIDÆ.

Genus SERPULA Linnaeus.

SERPULA INTRICA White.

Pl. I, Fig. 1.

Serpula intrica White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 205, Pl. 15, Fig. 5a.

Compare *Serpula gordialis* (Schloth.) Geinitz, Palæontographica, vol. xx, pt. 1, p. 282, Pl. 63, Figs. 2, 3.

“Tubes small, slender, cylindrical, smooth, very long and very tortuous, not perceptibly increasing in size, so far as our examples show, but neither the distal nor proximal extremity of the tube has been found unbroken.

“Diameter of the tube, a little more than 1 millimeter.

“This species is remarkable for the great length and uniform size of the tubes and for the intricacy of their contortions.

“*Position and locality.*—Strata of the Cretaceous period; southeast of Paria, Utah.”

SERPULA ? TENUICARINATA Meek and Hayden.

Pl. I, Fig. 2.

Serpula ? tenuicarinatus Meek and Hayden, 1857, Proc. Acad. Nat. Sci. Phila., p. 134; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 507. Pl. 6, Fig. 1.

“Tubes growing in groups, or rarely single, nearly cylindrical, increasing very gradually in size, irregularly curved, but apparently never spirally coiled, attached by the under side throughout most of the entire length; upper side having a distinct, rather sharply elevated, flexuous, longitudinal carina; surface smooth.

“Length unknown; average transverse diameter, 0.14 inch.

“Not having seen entire specimens of this species, it is with some doubt that it has been referred to the genus *Serpula*. It seems never to have internal septa as in *Vermetus*. It was originally placed provisionally in the genus *Serpula* and is here, in the same way, retained in that group.

“*Locality and position.*—Mouth of Vermilion river, [South] Dakota, on the Missouri, in the Fort Benton group of the upper Missouri Cretaceous series.”

MOLLUSCA.

PELECYPODA.

OSTREIDAE.

Genus OSTREA Linnaeus.

OSTREA PRUDENTIA White.

Pl. I, Figs. 3 and 4.

Ostrea prudentia White, 1876, U. S. Geol. Sur. West 100th Meridian, vol. iv., p. 171, pl. 14, Figs. 2a-d; 1884, 4th Ann. Rept. U. S. Geol. Sur. p. 299, Pl. 40, Figs. 5 and 6.

Compare *Ostrea patina* Meek and Hayden, 1856, Proc. Acad. Nat. Sci. Phila., p. 277; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 16, plates 10 and 11.

Original description:

"Shell neat and symmetrical for a species of this genus, suboval or subcircular in outline when adult, subcircular when young, moderately capacious; beaks small, usually distinct, and approaching so near to each other when the valves are together as to leave only a narrow space between the areas. Lower valve moderately deep; area short and broad; ligamental groove short, broad, and distinct, bounded at each side by a rounded ridge; beak extending very slightly beyond that of the other valve; scar of attachment sometimes occupying one-quarter of the outer surface, sometimes extremely small, and sometimes apparently absent. Upper valve usually flat or a little concave transversely; but a little convex longitudinally in adult shells; area a very little shorter than that of the other valve, moderately convex or nearly flat.

"Surface of both valves marked by distinct lines and laminae of growth, but this species is rather less laminated and roughened than is usual in the genus *Ostrea*. Somewhat numerous, corrugated, but rather indistinct, radiating costae are usually to be seen on the ventral valve of young examples, yet these corrugations seldom or never extend to the front half of old shells.

"Length, 6^{cm.}; breadth, 5^{cm.}

"This species is somewhat remarkable for its neatness of form and freedom from the crude extravagances which species of this genus often exhibit.

"*Position and locality.*—Strata of the Cretaceous period, east of Impracticable ridge, Utah."

This species so closely resembles some specimens of *Ostrea patina* M. & H., from the Montana formation, that I have been inclined to treat it as a synonym of that species. In the geology of the Uinta mountains Dr. White gives it in the list of species belonging to the Henry's Fork group, which has since been correlated with the Dakota, but a number

of the species in that list have been found to occur in the Colorado formation, and I have included all of them in its fauna, though some of them may have been found at a lower horizon than is usually regarded as the base of that formation.

OSTREA ANOMIOIDES Meek.

Pl. I, Figs. 5 and 6.

Ostrea anomioides Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 488; White, 1880, idem for 1878, p. 10, Pl. 11, Figs. 4a, b; 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 291, Pl. 39, Figs. 4 and 5.

Original description:

“Shell rather small, very thin, depressed plano-convex, and without any visible scar of attachment, varying from ovate to circular; rounded or sometimes a little straightened on the hinge margin; beaks scarcely projecting beyond the outline of the cardinal margin. Lower valve very shallow; cartilage pit unusually small, shallow, and short. Upper valve almost perfectly flat; cartilage attachment even shorter than that of the other valve, and slightly convex on its inner margin. Muscular scars unknown; surface of both valves with small regular concentric wrinkles most distinctly marked on the central region.

“Greatest diameter of one of the largest oval specimens, 1.70 inches; breadth, 1.40 inches; convexity, 0.23 inch.

“This species is remarkable for the thinness of the shell, the slight concavity of the under valve, and the flatness of the upper, as well as for its rounded or slightly straightened cardinal margin, and the absence of any scar of attachment, or of any traces of muscular impressions within. These external characters, and the regular small concentric wrinkles, give the exterior of the lower valve of circular specimens somewhat the appearance of a *Lucina* or *Dosinia*; while in other individuals it looks more like an *Anomia* or *Placuna*.

“*Locality and position*.—Missouri river, below Gallatin city, Montana. Cretaceous.”

OSTREA CONGESTA Conrad.

Pl. II, Figs. 2, 3, and 4.

Ostrea congesta Conrad, 1843, Nicollet's Rept. of Explorations in the Northwest, p. 167; Hall, 1856, Pacific R. R. Reports, vol. III, p. 100, Pl. 1, Fig. 11; Meek, 1876, U. S. Geol. Sur., vol. IX, p. 13, Pl. 9, Figs. 1a-f; White, 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 294, Pl. 39, Figs. 11, 12, 13.

Prof. Meek's description is as follows:

“‘Shell elongated; upper valve flat; lower valve ventricose, irregular; umbo truncated by a mark of adhesion.’ (Conrad.)

“This is a small, thin shell, the individuals of which are often crowded together in considerable numbers, so as to assume quite irregular forms. In cases where the individuals had room to grow without

interruption, the young shell is usually found to be of an ovate form, and attached by the whole under surface of the lower valve, the beak of which is pointed, provided with a small triangular area, and usually turned a little to the left. In this form they continue to grow to lengths varying from 0.25 to 1 inch, when the margins are abruptly deflected upward at right angles to the flat attached base, and produced in this direction often for as much as an inch or more; the greatest extension being on the lateral margins and at the extremity opposite the beaks. When seen at this stage of their growth, separated from the body to which they were originally attached, and lying partly embedded in the matrix, with the beak side down, they look like short cylindrical tubes, with one end abruptly truncated and closed by the flat surface of attachment; so that what was originally the whole under surface of the valve now appears like the truncated umbo.

"The other valve is quite flat, or sometimes a little concave, and always retains the form possessed by the attached valve at the time its margins became deflected upward, after which it seems to have increased very little in size. Its umbo is usually a little less pointed than that of the other valve, and provided with a shorter area, on each side of which its margins are sometimes slightly crenulated.

"The muscular impressions of both valves are obscure, and the surface is nearly smooth, or only marked by fine, indistinct lines of growth.

"*Locality and position.*—At numerous places along the Missouri between the Big Sioux and the Great Bend; also on the Little Blue river, near the Kansas and Nebraska line, and near the Black hills, on Cheyenne river, as well as on the North Platte; in the Niobrara group, or formation No. 3, where it is usually found attached to fragments of a large *Inoceramus*. It likewise occurs at several localities in New Mexico and Colorado, probably in the same position."

OSTREA SOLENISCUS Meek.

Pl. II, Fig. 1; Pl. III, Figs. 1 and 2.

Ostrea soleniscus Meek, 1871, Proc. Am. Philos. Soc., vol. XI, p. 430; 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 487; White, 1880, *idem* for 1878, p. 9, Pl. 11, Figs. 2a, b; 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 300, Pl. 42, Fig. 1.

Ostrea cortex White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 170, Pl. 15, Fig. 2a-c.

Not *Ostrea cortex* Conrad, 1857, U. S. and Mex. Bound. Sur., vol. I, p. 157, Pl. 11, Fig. 4a-d.

"Shell attaining a large size, becoming rather thick in adult examples, generally straight, greatly elongated, and comparatively very narrow, with parallel lateral margins. Lower valve with moderate internal concavity, and having the appearance of a little gutter or elongated trough; beak usually nearly straight, rather obtusely pointed, and more or less distorted by the scar of attachment; ligament area of moderate size, strongly striated transversely, and provided with a large,

deep longitudinal furrow; surface apparently only with moderately distinct marks of growth. Upper valve almost nearly flat externally, but nearly as concave as the other within; beak usually a little truncated; ligament area marked with strong transverse striæ, and having its mesial ridge very prominent, and occupying as much as one-third its breadth; surface as in the other valve, or perhaps a little smoother.

“Length of adult examples about 18 inches; breadth of same about 2.50 to 3 inches.

“Although not a very uncommon species, I have seen no entire specimens of this remarkable shell. It will be readily known by its usually narrow, elongated, and generally straight form. The shell is usually found broken into several pieces, but casts of the internal cavity are not unfrequently met with entire. One of these before me is nearly 1 foot in length and only 2 inches in breadth. It often had a curious habit of growing in groups of three shells, attached to each other by the backs of their beaks. I have seen large numbers of them closely arranged, or nearly in contact with each other, at Coalville, all with their beaks downward, or at right angles to the planes of the sandstone strata. When found where it grows isolated, the shell is sometimes arched to one side.

“*Locality and position.*—This species ranges through nearly the whole thickness of the Cretaceous sandstones near Coalville, Utah, and is also found in the Cretaceous coal-bearing sandstones at Bear River city, Wyoming, as well as in a sandstone ridge of same age on Union Pacific railroad, a few miles east of the latter locality.”

The above is Prof. Meek's revised description of this species, which, as he intimates, ranges from beds containing an undoubted Colorado fauna far up into those that probably belong to the Montana.

Associated with the very slender forms there are other shorter ones broadly ovate in outline that apparently belong to the same species. The specimens from southern Utah that were referred to *Ostrea cortex* are of this character. The beaks are usually more or less exogyrate in form, this feature being most marked on the upper valve of the broader specimens. The same species occurs in the Lower Cross Timber sandstone of Denton county, Tex.

OSTREA MALACHITENSIS n. sp.

Pl. II, Figs. 5, 6, 7, and 8.

Shell rather small, irregularly subtriangular in outline; cardinal margin long and nearly straight, more or less distinctly auriculate in front of the beaks, which are small and inconspicuous; lower valve moderately convex, with the greatest convexity along an oblique line from the beak to the middle of the postero-basal margin, which is there broadly emarginate, thus giving the shell a saddle-shaped or bilobate form. The outline of the shell, exclusive of this broad lobe and the

small triangular anterior alation, is oblong oval. Upper valve nearly flat or slightly concave, excepting on the posterior margin, where there is a broad downward flexure corresponding to the emargination and the convexity of the lower valve. Surface of both valves marked only by lines of growth and a few concentric laminae.

The largest examples measure 45^{mm} from beak to base, and about the same in the greatest length at right angles to that line.

The numerous examples from several localities show less variation in form than is usual in species of *Ostrea*. Its outline suggests *O. mal-leiformis* Gabb from the Chico group of California, but the differences seem to be sufficiently great and constant to warrant their separation.

Locality and position.—In the Pugnellus sandstone near Malachite post-office, Poison canyon, and other localities in Huerfano park, Colorado, and at about the same horizon 20 miles above Pueblo.

OSTREA LUGUBRIS Conrad.

Pl. IV, Figs. 1-10.

Ostrea lugubris Conrad, 1857, U. S. and Mex. Boundary Rept., vol. I, p. 156, Pl. 10, Figs. 5a, b; Meek, 1876, Macomb's Expl. Exped. from Santa Fé to Junct. of Grand and Green rivers, p. 123, Pl. 1, Figs. 1a-d; White, 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 297, Pl. 51, Fig. 3.

Ostrea bellaplicata Shumard, 1860, Trans. St. Louis Acad. Sci., vol. I, p. 608; White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 276, Pl. 4, Figs. 3a, b, and Pl. 8, Figs. 2a, b; White, 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 292, Pl. 78, Figs. 1, 2, 3.

Ostrea (Alectryonia) blackii White, 1880, Proc. U. S. National Museum, vol. II, p. 293, Pl. 4, Figs. 1, 2; Ann. Rept. U. S. Geol. Sur. Terr. for 1878, p. 11, Pl. 14, Figs. 1a, b, Pl. 17, Fig. 4; 4th Ann. Rept. U. S. Geol. Sur., p. 292, Pl. 45, Fig. 1, and Pl. 46, Fig. 2.

Shell varying in size from small to medium; outline usually broad, subovate, but in small specimens often nearly circular and in larger ones occasionally subtriangular; lower valve moderately convex, the greatest convexity being along the median line, which is often subangular in large shells; beak usually small and inconspicuous, but sometimes more prominent and curved laterally, often obscured by the scar of attachment, which is usually present and is proportionately very large in the dwarf variety represented by Conrad's type. Surface marked by from twelve to eighteen strong plications, that radiate from the beak or the scar of attachment, and by strong concentric lines, and sometimes by imbrications of growth. The plications are usually simple, but occasionally they bifurcate. Upper valve nearly flat or sometimes slightly concave, with an outline similar to that of the other valve, excepting that it is somewhat more narrow along the hinge line. Its surface is smooth for some distance around the beak and the plications toward the margin are not as strongly developed as on the lower valve, which it resembles in other respects. The muscular scars are reniform and subcentral; ligamental area varying greatly in size and form, but never very large.

Conrad's type (lower valve) measures 17^{mm} from beak to base, 15^{mm} in breadth, and 5^{mm} in convexity, while the corresponding measurements of *Ostrea blackii*, which is the largest variety of the species, are 68, 62, and 32^{mm}, respectively.

The extreme varieties of the three forms included in the above description differ greatly from each other, and when the intermediate forms and the facts concerning their distribution were unknown it was natural that they should be regarded as distinct species. Conrad's types were small specimens from "east of Red river (Canadian), New Mexico, Santa Fé road," where they occur in a band of brown calcareous sandstone containing *Prionocyclus macombi*, sharks' teeth, etc. The same dwarf form is found in a similar rock in New Mexico and southern and southwestern Colorado. In Huerfano park and adjacent regions of Colorado the position of this brown band, which is from two to four feet thick, is at the base of the Niobrara limestone, and the paleontological evidence shows that it is on about the same horizon at the other localities. In Huerfano park the Pugnellus sandstone, which immediately underlies this brown band, contains great numbers of a larger *Ostrea* that is absolutely identical in form with some of the Texan specimens of *Ostrea bellaplicata*, but associated with them are smaller individuals with larger scars of attachment showing every gradation from the *bellaplicata* to the *lugubris* form. At Rattlesnake butte, Colorado, *O. lugubris* was found in the brown band, while the shales beneath yielded fragments showing all the characters of the large *O. blackii*. The collections from Texas show the forms intermediate between *O. blackii* and *O. bellaplicata*, both of which came from the Eagle Ford shales, the equivalent of the beds from which the Colorado and New Mexican specimens were obtained. From the above facts it seems to me evident that Conrad's type specimens were representatives of a variety that was dwarfed by unfavorable conditions, while the same species under more favorable circumstances reach the large size of *O. bellaplicata* and *blackii*. The examples selected for illustration represent most of the varieties excepting the largest ones, figures of which may be found in the Fourth Annual Report U. S. Geological Survey.

OSTREA UNIFORMIS Meek.

Pl. III, Figs. 3 and 4.

Ostrea (*Gryphæa*?) *uniformis* Meek, 1876, Macomb's Expl. Exped. from Santa Fé to Junct. Grand and Green rivers, p. 124, Pl. 1, Figs. 2a, b, c; White, 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 302, Pl. 48, Figs. 6 and 7.

Original description:

"Shell small, rather thin, trigonal-ovate or subcircular in form, not oblique; under valve rather deep, subcarinate along the middle, and arched beneath from the beak to the opposite margin; beak curved upward, but truncated by the area so as to rise little above the margins;

area small; margins on each side of the area sometimes faintly marked by fine crenulations along the groove for the reception of the edge of the upper valve; surface marked by about three or four rather regular plications on each side of the larger mesial fold or carina; lines of growth obscure; muscular scar transversely oval, moderately distinct; upper valve unknown.

"Length from the beak to the opposite extremity, 1.16 inches; antero-posterior diameter, about 1 inch; convexity or depth of the under valve, 0.65 inch.

"This is a very peculiar shell, and can not be confounded with any other species with which I am acquainted. Its large, prominent, mesial fold, extending from near the beak of the under valve to the opposite extremity, with three or four smaller plications on each side, give it much the appearance of some of the plicated brachiopoda when viewed on the under side. The folds, or plications, vary somewhat on different specimens; but usually they are remarkably uniform for a species of this genus, and impart to the free margin opposite the beak a zigzag character, very similar to the front of some species of *Spirifer*. No specimens of the upper valve were obtained; but it will probably be found to have a large mesial sinus corresponding to the elevation of the other valve, and must possess a projection, curving down at the middle of the free margin opposite the beaks, to fill the deep notch in the margin of the other valve.

"Thinking this species might be identical with one or the other of two peculiar oysters described by Dr. Shumard, from the Cretaceous rocks of Texas, under the names *O. bellaplicata* and *O. quadriplicata*, I sent him sketches of our shell, and he wrote that it is most nearly like his *O. bellaplicata*, though he thinks clearly distinct. The *O. bellaplicata* attains a much larger size, some of the specimens being as much as 3 inches in indiameter, while its hinge-line is proportionally much longer, and its surface distinctly ornamented with concentric markings."

Locality and position.—Near the base of the Colorado shales at Pagosa springs, Colorado, where it is associated with *Ostrea lugubris*, *Inoceramus labiatus* (= *I. problematicus*), and *I. fragilis*.

Genus GRYPHÆA Lamarck.

GRYPHÆA NEWBERRYI n. sp.

Pl. v, Figs. 1-5.

Gryphæa pitcheri White, 1876, U. S. Geog. and Geol. Sur. west 100th meridian, vol. IV, p. 171, Pl. 17, Figs. 1a-f.

Gryphæa pitcheri Newberry and Meek, 1876, in Macomb's Expl. Exped. from Santa Fé to Junct. of Grand and Green rivers.

Not *Gryphæa pitcheri* Morton, 1834, Synopsis Org. Rem. Cret. Group, p. 55, Pl. 15, Fig. 9.

The following is a copy of Dr. White's description and comments:

"Shell reaching a moderately large size, very variable in shape, gen-

erally having an irregularly subovate marginal outline, often much longer than broad, but sometimes shorter than broad. Larger valve capacious, scaphoid, arcuate, more or less distinctly lobed, the posterior lobe occasionally somewhat wing-like; test rather thick; umbo large, prominent, and incurved, or flattened and short; scar of attachment small or wanting; surface sometimes distinctly lamellose, but generally somewhat smooth, although marked by concentric lines of growth.

“Upper valve nearly flat, moderately thick in the umbonal region; hinge line well defined, straight; area distinct; ligamental groove small; inner surface smooth, more or less distinctly crenulated at the lateral edges; outer surface marked by numerous concentric, imbricating lines of growth, and sometimes also by faint, impressed radiating striæ.

“The collections contain numerous examples of this widely-known species, none of which, however, are of so large a size as are some of those figured by Roemer, Conrad, and others. In selecting examples for illustration I have chosen representatives of two extremes of form from among others of all intermediate gradations. Mr. Conrad states (loc. cit.) that there are two distinct varietal types of this species, one of which resembles *G. vesicularis* Lamarck, and which was the typical form described and figured by Dr. Morton; and the other he designates as var. *navia*. The collections under examination, however, although they contain representatives of the two forms referred to by Mr. Conrad, seem to indicate no constancy of separate varietal character, either of those forms or any others.

“The largest specimens in the collections have a length of only about 37 millimeters from the umbo to the basal margin, which is considerably less than that of some examples reported by other authors.”

It is with much hesitation that I propose a new name for this form, because as a rule species of the Ostreidæ are difficult to define, and because I do not wish to add to the confusion that has long prevailed concerning *Gryphæa pitcheri*.¹ The latter species is very abundant in, and has been regarded as characteristic of, the Comanche series, or Lower Cretaceous, of Texas and adjacent regions.

The form now under consideration occurs in great numbers in the lower part of the Upper Cretaceous shales in southeastern Utah and adjacent portions of Colorado, Arizona, and New Mexico, where it is associated with characteristic fossils of the Colorado formation, such as *Inoceramus labiatus*, *Inoceramus fragilis*, and many others. It is reported from this horizon at many localities by Dr. Newberry.²

It was collected by Mr. C. D. Walcott about 350 feet above the base of his Cretaceous section in Upper Kanab valley, Utah, and the speci-

¹ For discussions of *Gryphæa pitcheri* and its varieties see R. T. Hill in Ann. Rept. Arkansas Geol. Sur., 1888, Vol. II, pp. 168-174, and Bull. No. 4, Tex. Geol. Sur., p. 4, and Jules Marcou, Am. Geologist, Vol. III, p. 188.

² Macomb's Expl. Exped. Geol. Rept., pp. 33, 52, 71, 87, 107, etc.

mens described by Dr. White came from the same general region. I have collected it near Mancos, in southwestern Colorado, from shales overlying sandstones referable to the Dakota formation and just beneath a band of limestone containing *Inoceramus labiatus*. This difference in geologic horizon would not justify the separation of these fossils from *G. pitcheri* if they were identical in form. But while there is a general resemblance, and possibly examples of the *G. pitcheri* of Texas might be selected that could not be distinguished from some of the western ones, the differences are as a rule sufficient to make them easily separable. The fact that the western form occurs in later beds and that all its faunal associates are different necessarily gives greater importance to slight differences in form. Compared with typical examples of *G. pitcheri* it has broader and less distinct beaks, smoother surface and more rounded outlines, and it never attains so large a size. The specimen represented by Pl. v, Figs. 3 and 4, is the largest I have seen.

Some of the smaller examples have a superficial resemblance to *Gryphæa vesicularis* var. *aucella* Roemer, but the latter is more alate and its beak is not so much incurved.

Of European species small examples of *Ostrea proboscidea* Archiac and some specimens of *Ostrea vesiculosa* Guéranger as figured by Coquand¹ closely resemble this species.

Genus EXOGYRA Say.

EXOGYRA SUBORBICULATA Lamarck (sp.).

Pl. v, Fig. 6; Pl. vi, Figs. 1 and 2; Pl. viii, Fig. 1.

Gryphæa suborbiculata Lamarck, 1802, *Système des Animaux sans Vertébres*, p. 398.

Gryphites ratisbonensis Schlotheim, 1813, *Min. Tasch.*, vol. vii, p. 105.

Gryphæa columba Lamarck, 1819, *op. cit.*, vol. vi, p. 198.

Ostrea ratisbonensis Coquand, 1869 (with full synonymy), *Monog. Gen. Ostrea, Terr. Crét.*, p. 121.

Exogyra suborbiculata Stoliczka, 1871, *Cret. Pelecypoda of Southern India*, p. 462.

Shell large, comparatively thin, irregularly suborbicular or subovate in outline. Lower valve very convex; umbonal region narrow and prominent; beaks relatively small, distinctly coiled, more or less separated from the body of the shell. Full-grown individuals have a broad distinct furrow or depression extending obliquely from the umbonal region to the postero-basal margin. Surface smooth, marked only by lines of growth. Upper valve represented in the collection by fragments that show that it was suborbiculate, nearly flat, with distinctly coiled beak and marked by obscure concentric ridges near the periphery.

An average sized specimen gives the following measurements: Length from beak to base, 82^{mm}; greatest transverse breadth, 80^{mm}; convexity, about 43^{mm}.

¹ *Monog. Genre Ostrea, Terr. Crét.*, pls. 16 and 59.

The fossils from Colorado above described seem to agree in every respect with many of the published figures of the common European species that is usually described under the name of *Ostrea* or *Exogyra columba*. The differences are certainly not greater than those shown by some of the forms referred to the species by European authors. The species is known to have a wide geographic distribution, occurring throughout Europe and in southern India in the Middle Cretaceous (Cenomanian and Turonian). It is said to be best developed in the zone with *Inoceramus labiatus*. With these facts before us it ought not to be surprising to find the species associated with a similar fauna in this country. On the contrary, it is strange that it has so long escaped observation here.

Exogyra columbella Meek may prove to be only the young or a variety of this species, but the two forms have not yet been found associated at the same localities, and it is thought best to treat them separately for the present.

Locality and position.—In the Pugnellus sandstone near Malachite post-office and Poison canyon, in Huerfano park, and at about the same horizon at Rattlesnake butte and on the Arkansas river, 20 miles above Pueblo, Colo.

EXOGYRA COLUMBELLA Meek.

Pl. VIII, Figs. 2, 3, and 4.

Exogyra costata, var. *fluminis* White, 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. iv, p. 174, Pl. 17, Figs. 3a-d.

Exogyra columbella Meek, 1876, Macomb's Expl. Exped. from Santa Fé to junction of Grand and Green rivers, p. 124, Pl. I, Figs. 3a-d; White, 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 304, Pl. 55, Figs. 5 and 6.

Prof. Meek's description and comments are as follows:

"Shell small, rather thin, ovate; posterior side forming a semioval curve from the umbo to the ventral edge; anterior side rounded below the beak; ventral margin rounded. Lower valve convex, the most gibbous part sometimes forming an obtuse umbonal prominence, which is not separated from the front by a sulcus; beak slender, pointed, and distinctly coiled to the left; surface ornamented by small, but distinct, rather regular, radiating costæ, which bifurcate along the umbonal ridge; marks of growth rather obscure. Upper valve flat, oval, apparently smooth, or only having obscure lines of growth.

"Length from the most prominent part of the umbo to the ventral margin, 1 inch; transverse breadth, 0.72 inch; depth or convexity, about 0.42 inch.

"It is possible that this shell may be identical with *E. læviuscula* of Roemer,¹ but with the means of comparison now within my reach I can but regard it as distinct. All the specimens of it that I have yet seen are more oval in form and have a less distinctly spiral beak than the form

¹ Kreid. von Texas, Pl. IX, Fig. 3a, b, c.

described by Roemer. They also differ in having the under valve always marked by regular radiating costæ, while that of *E. læviuscula* is generally quite smooth, or rarely presents traces of nearly obsolete, rather broad, plications, as represented by Fig. 3c of Roemer's Pl. IX (Kreid. von Texas). It seems likewise to be a thinner and less robust shell than Roemer's species, and holds a lower stratigraphical position. In surface markings, as well as in general form, it closely resembles young specimens of *E. columba* of Lamarck (Anim. sans Vert., VI, 198), as figured by Goldfuss in his Petrefact. Germ., and by d'Orbigny in the Paleont. Français. It never attains more than one-eighth the size of adult individuals of that species, however, and differs in having an oval instead of a circular upper valve."

Locality and position.—From the Lower Cretaceous of Dr. Newberry's New Mexican section at Covero, New Mexico, and from the base of the Middle Cretaceous of the same section at Galisteo, and in the Sierra Abajo. The specimens described by Dr. White came from the east bank of Rio Puerco, 6 miles below Casa Salazan, New Mexico, and it has also been collected in the Lower Cross Timber sands and in the Eagle Ford shales of Texas.

EXOGYRA LÆVIUSCULA Roemer.

Pl. VIII, Figs. 5 and 6.

Exogyra læviuscula Roemer, 1852, Kreidebildungen von Texas, p. 70, Pl. 9, Figs. 3a-c; Conrad, 1857, U. S. & Mex. Bound. Sur., p. 154, Pl. 7, Figs. 4a, b; White, 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, p. 173, Pl. 17, Figs. 2a-d; 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 305, Pl. 52, Figs. 3, 4, 5.

Ostrea ferdinandi Coquand, 1869, Monog. Gen. Ostrea, Terr. Crét., p. 33.

Exogyra ponderosa Hill, 1889, Check List Cret. Invert. Fossils of Texas, p. 6.

"Shell of moderate size, capacious, somewhat semiovate in form, suborbicular in marginal outline; test not massive; larger valve much inflated and subhemispherical; a very indistinctly defined umbonal ridge is to be seen upon some examples, especially near the beak, but in others this feature is wanting.

"Umbo small, distinctly spiral, making about two volutions, sometimes nearly free, but often very closely curved, giving the posterior side an umbilicated character, sometimes having a very small scar of attachment, but often without such a scar, and always quite symmetrical, or at least not distorted, as the beak often is in other species of this genus; periphery of its curve usually extending beyond the hinge line, but sometimes not. The smaller valve is nearly flat, or slightly and somewhat irregularly concave, suborbicular in outline. Surface of both valves having a smooth aspect, but it is marked with such lines of growth as are common to other genera of shells, and free from the lamination of surface so common in the Ostreidæ.

"Diameter of the largest example in the collection, from umbo to basal margin, 47^{mm}; transverse diameter, 42^{mm}; depth of the larger valve, 28^{mm}.

"The collections contain numerous examples of this species, the type specimens of which were obtained by Dr. Roemer from near San Antonio, Texas. The figure given by Dr. Roemer (loc. cit.) represents the the umbo of the larger valve more nearly free than that of any of our examples is, the umbo in all of our examples being closely incurved. In this respect ours are more nearly like those figured and described by Conrad.

"*Position and locality.*—Strata of the Cretaceous period, Linear plateau, southeastern Utah."

The above description is quoted from Dr. White's report in the Survey West of the one hundredth Meridian. Coquand proposed a new name for the species because Münster had previously described an *Ostrea læviuscula*, but as Münster's species was not an *Exogyra* the change was unnecessary.

It may be that Mr. R. T. Hill is right in regarding these fossils as young individuals of *Exogyra ponderosa*. The fact that they occur together would cause one to suspect their identity, but those described under the name *E. læviuscula* are smoother shells, with a more nearly circular outline and less angular umbonal region than *E. ponderosa*, even when of the same size.

EXOGYRA PONDEROSA Roemer.

Pl. VII, Figs. 1, 2.

Exogyra ponderosa Roemer, 1852, Kreidebildungen von Texas, p. 71, Pl. 9, Figs. 2a, b; White, 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. IV, p. 172, Pl. 14, Figs. 1a-c; 1884, 4th Ann. Rept. U. S. Geol. Sur., p. 306, Pl. 50, Figs. 1, 2, 3.

Exogyra costata, var. Con., 1857, U. S. & Mex. Bound. Sur., vol. I, p. 154, Pl. 8, Fig. 3, Pl. 9, Fig. 1.

?*Exogyra fimbriata* Con., 1857, Ibid., Pl. 7, Figs. 2a, b.

"Shell large, capacious; marginal outline irregularly subovate; larger valve very gibbous; umbo distinctly spiral, but the coil is usually obscured by a large scar of attachment; umbonal half obtusely carinate, the sides sloping abruptly from the carina to the margins; basal half not so deeply, but more regularly convex than the other. Test very massive, sometimes having a solid thickness of five or six centimeters, lamellose, so much so that the valve often splits into numerous pieces along the surfaces of the layers of growth; inner surface smooth; muscular scar of moderate size, somewhat deep, placed about midlength of the valve, and, as usual, a little nearer to the posterior than to the anterior side; surface marked by strong, irregular, imbricating lamellæ of growth, which become laciniate at and near the margins; surface also marked by fine concentric striæ, and by irregular, indistinct, radiating costæ, the latter being usually removed by exfoliation from old shells. The collections do not contain any example of the upper valve, but both Roemer and Conrad describe it as thick, concentrically laminated; smooth within; umbo horizontal, distinctly spiral.

"Length of an example rather under the average size, from umbo to basal margin, about 1^{dm}; breadth, 8^{cm}; convexity of the large valve, nearly 6^{cm}.

"Among the numerous examples of this species in the collections, none, except the one figured, show the radiating costæ, and these costæ seem to be quite different from those, at least of the typical forms, of *E. costata* Say. Mr. Conrad states, however, that in New Jersey, Alabama, and Texas every intermediate gradation of form and character is found, from typical forms of *E. costata* to *E. ponderosa*. Judging from our examples alone, no person would suspect such specific relationship; and, in want of any intermediate forms for personal examination, I prefer at present to place our examples under the designation given by Dr. Roemer.

"*Position and locality*.—Strata of the Cretaceous period; east of Impracticable ridge, Utah."

The above is Dr. White's description of the Utah fossils which do not differ in any respect from examples collected at Roemer's typical locality. Mr. R. T. Hill has shown that in Texas the typical *Exogyra costata* is characteristic of the uppermost beds of the Cretaceous, while *E. ponderosa* occurs at a lower horizon, ranging down as low as the Austin limestone. My observations in Texas and several other southern states have confirmed this fact. It is therefore better as a matter of convenience and for use in geologic work to keep these varieties under separate specific names.

ANOMIIDÆ.

Genus ANOMIA Linnæus.

ANOMIA SUBQUADRATA n. sp.

Pl. VIII, Figs. 8 and 9.

Upper valve subquadrate in outline, thin and pearly, varying greatly in convexity; cardinal margin straight, or very slightly arched, about half as long as the greatest antero-posterior diameter of the shell; posterior margin nearly straight in the middle and rather abruptly rounded above and below to join the cardinal and ventral margins respectively; ventral and anterior margins forming a continuous curve, which is more narrowly rounded in the middle; beak inconspicuous, submarginal. Surface marked by obscure, concentric undulations and lines of growth, and very faint traces of radiating striæ.

The figured types have the following dimensions: Height, 20 and 23^{mm}; transverse diameter, 22 and 23^{mm}; convexity, 6 and 3^{mm}.

This species has some resemblance to *Anomia nitida* Meek.¹ It is possible that they may prove to be identical when good material for

¹ Macomb's Expl. Exped. from Santa Fé to junction of Grand and Green rivers, Geol. Rept., p. 125, pl. 1, Figs. 4a and b.

comparison is secured, but as *A. nitida* comes from a considerably higher horizon and the original description and figures show a different outline, as well as differences in the surface characters, it is thought best to treat them as distinct.

Anomia truncata Geinitz, as figured by Reuss,¹ is very much like this species.

Locality and position.—In the Pugnellus sandstone on Williams creek, Huerfano park, Colorado.

ANOMIA CONCENTRICA Meek.

Pl. VIII, Fig. 7.

Anomia concentrica Meek, 1860, Proc. Acad. Nat. Sci. Phila., vol. 12, p. 311;—1876. Simpson's Rept. Expl. across Great Basin of Utah, p. 359, Pl. 4, Fig. 3.

Original description:

"Shell small, thin, subcircular or transversely a little oval; lateral extremities nearly equally rounded; cardinal margin rather straight or but slightly arched; beak very small, central, compressed, marginal, not projecting beyond the cardinal border; surface of upper valve ornamented by moderately distinct regular, concentric undulations, and much smaller obscure lines of growth. Transverse diameter 0.64 inch; length from hinge to the opposite margin 0.50 inch."

Locality and position.—On Sulphur creek near Bear river, Wyoming, in whitish sandstone associated with *Inoceramus* and *Ostrea soleniscus*. I am not positive whether this comes from the bed containing *I. labiatus* and *Pugnellus fusiformis* or from a somewhat higher horizon.

ANOMIA PROPATORIS White?

Pl. VIII, Fig. 10.

Anomia propatoris White, 1880, Contributions to Paleontology, Nos. 2-8, p. 14, Pl. 12, Figs. 15 a and b, Ann. Rept. U. S. Geol. Sur. Terr. for 1878.

"Shell rather small, irregular, and a little obliquely subovate or subcircular in marginal outline; test pearlaceous and moderately thin as is usual in *Anomia*. Upper valve convex; beak small, depressed, not quite marginal; surface marked by somewhat coarse, irregular wrinkles of growth, by a few radiating wrinkles in the umbonal region and by fine, close-set, raised, radiating striæ, the latter appearing more distinctly on the forward part of the shell than elsewhere. Under valve unknown.

"Length of the most perfect example in the collection, 11^{mm}; breadth, 10^{mm}; convexity, 5^{mm}.

"This shell resembles *A. gryphorhynchus* Meek, the typical examples of which are from the Laramie strata of the Bitter Creek series, south-

¹ Verstein Böhm. Kreidef., II, p. 45, pl. 31, Figs. 12-14.

ern Wyoming, but it differs from that species in having a less prominent and rounded umbo; in possessing radiating and concentric wrinkles and radiating raised striæ, while that species is an unusually smooth one. In the possession of the radiating raised striæ it corresponds closely with *A. micronema* Meek, which is so commonly distributed throughout the Laramie group. As this striation constitutes a more important characteristic than mere form, which is always variable in this genus, it strongly suggests an intimate generic relation for our shell with *A. micronema*."

The specimen now under consideration is slightly more irregular in form and bears rather stronger radiating striæ than the type, but the variation is not greater than is often observed in species of this genus.

At Coalville, Utah, in the same stratum from which the type was obtained, much larger specimens have been found that doubtless belong to this species. They have the same form of outline, but are less convex. Casts of similar specimens occur in Huerfano park, Colorado, where they are associated with others (described above) that seem to be specifically distinct.

Locality and position.—The specimen figured is from the Pugnellus sandstone on Muddy creek, Huerfano park, Colorado. The type of the species was found at a higher horizon in the "third ridge" at Coalville, Utah.

ANOMIA ? OBLIQUA M. & H.

Anomia obliqua Meek & Hayden, 1860, Proc. Acad. Nat. Sci., Phila., p. 181.

Anomia? obliqua Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 22, Pl. 9, Fig. 2.

This species, which is represented by a single valve, the type, is said to come from the Niobrara division of the Upper Missouri Cretaceous, near the mouth of the Niobrara river. Although the internal characters can not be seen, I am confident that the type is an *Ostrea*, and probably an immature individual of *O. patina*, M. & H.

Genus PLACUNOPSIS Morris & Lycett.

PLACUNOPSIS? HILLIARDENSIS White.

Pl. VIII, Fig. 11.

Placunopsis hilliardensis White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 278, Pl. 7, Fig. 14a.

Original description:

"Shell small, broadly oval or subcircular, slightly oblique; test thin, fragile, papyraceous; margins somewhat irregular; upper valve moderately convex; umbo submarginal, the apex depressed and not clearly defined. Surface conspicuously marked with numerous coarse, radiating, irregularly undulating, abruptly raised lines, which are wider than the space between them, and some of which appear to have ended at the border, or upon imbricating concentric lines, as tubular or semi-

cylindrical processes. Diameter of the few examples obtained, about 12^{mm}.

"Although the hinge and interior of this shell are not known, it seems to be a species of true *Placunopsis* Morris & Lycett, and to be nearly related to their typical species, although the latter (*P. jurensis* M. & L., Monog. Gr. Ool. Mol., p. 6, Pl. 6, Figs. 8, 8a, and 8b) is of Jurassic age, while the former is Cretaceous. This appears to be the only known species of this genus in the Cretaceous rocks of the United States, but Mr. Meek¹ suggests that the *Anomia subtrigonalis* of Meek and Hayden from the Fort Pierre group of the Upper Missouri probably belongs to the genus *Placunopsis*. Our species differ conspicuously from that one in being radiately marked, and also in the character of its marginal outline and general aspect.

"It is true that neither the under valve nor the interior of our species is known; but the characters, so far as they are known, very plainly indicate the genus to which it is referred. In its marginal outline and surface markings it resembles the *Capulus occidentalis* of Hall and Meek, from the Upper Missouri river region, as figured by those authors, but the distinct laminated pearly texture of the shell substance would forbid its reference to that genus if its other characters were less doubtful.

"*Position and locality.*—Strata of the Fox Hills group, near Hilliard station, Union Pacific railroad, Wyoming."

Additional collections from the neighborhood of the original locality have added nothing to our knowledge of the generic relationship of this species. It seems to me that shells of this type should be referred to *Anomia*, at least until their internal structure is known. When this description was written all of the Cretaceous sandstones in the neighborhood of Hilliard, which is on Sulphur creek not far from Bear river, were referred to the "Fox Hills" or Montana formation. It is now known that a large part of these sandstones belong to the Colorado, but it has not been definitely determined whether the uppermost beds containing this species, *Neritina incompta* and a few other forms, should be assigned to it or to the Montana.

SPONDYLIDÆ.

GENUS PLICATULA LAMARCK.

PLICATULA HYDROTHERCA White.

Pl. IX, Figs 1 and 2.

Plicatula hydrotheca White, 1876, Geol. Uinta. Mts. p. 113; 1879, 11th Ann. Rept. U. S. Geol. Sur. Terr., p. 279, Pl. 6, Figs. 3a and b.

Revised description:

"Shell of ordinary size, a little obliquely and irregularly subovate in marginal outline; rostral region narrowed, its sides nearly straight

¹ U. S. Geol. Surv. Terr., vol. IX, 4to., p. 23.

or only slightly convex; the remainder of the free border somewhat regularly convex or rounded; lower valve broadly convex; hinge-teeth well developed; ligamental fosset moderately large; upper valve nearly flat or slightly concave in the rostral region. Surface of both valves marked by small, slightly raised, radiating plications, which are crenulated, a little irregular, increase in number both by bifurcation and implantation, and are more or less distinct upon all parts of the surface of both valves.

“Length, 3^{cm}; greatest breadth, 24^{mm}.

“*Position and locality.*—Cretaceous strata, probably equivalent with the lower portion of the Colorado Group; head of Water-pocket canyon, southern Utah.

“Collected by Mr. G. K. Gilbert.”

Only the original types, which are imperfect casts in sandstone, have been found. It is possible that better collections would show that this species is the same as *Plicatula arenaria* Meek, but with only the imperfect material now in hand it is necessary to keep them separate.

PLICATULA ARENARIA MEEK.

Pl. IX, Figs. 3 and 4.

Plicatula arenaria Meek, 1876, Macomb's Expedition from Santa Fé to junction of Grand and Green rivers, Geol. Rept., p. 126, Pl. 1, Figs. 5 *a*, *b*, and *c*.

Original description:

“Shell small, broad-ovate, usually a little oblique; ventral margin rounded; sides converging to the beaks at an angle of about 70° to 80°; beaks more or less angular. Under valve moderately convex. Upper valve nearly or quite flat. Surface of each valve ornamented by eighteen to twenty small, rather sharply elevated plications, only about half of which extend to the beaks, while the intermediate ones usually extend from one-third to one-half way from the free margins; concentric markings rather obscure.

“Length from beak to the most prominent part of ventral margin, 0.50 inch; transverse diameter, 0.43 inch; convexity, 0.11 inch.

“Resembles, in size and form, *P. incongrua*, Conrad (United States and Mexican Boundary Report, vol. I, Pl. 6, Fig. 10, 1857), but differs in not having squamose concentric markings, as well as in having shorter plications intercalated between those that extend to the umbo. The substance of the shell must be thin, since the plications are rather distinctly marked on internal casts.

“*Locality and position.*—Covero [New Mexico]; Lower Cretaceous of Dr. Newberry's section.”

LIMIDÆ.

Genus LIMA Bruguière.

LIMA UTAHENSIS n. sp.

Pl. IX, Fig. 5.

Lima wacoensis White, 1876, U. S. Geog. & Geol. Expl. West 100th Meridian, vol. IV, p. 176, Pl. 17, Figs. 4a, b, and c.

Not *Lima wacoensis* Roem., 1852, Kreide. von Texas, p. 63, Pl. 8, Fig. 7a, b.

Dr. White's description is as follows:

"Shell rather small, moderately convex, oblique, irregularly oval in marginal outline; antero-basal margin broadly rounded; posterior margin regularly, but more shortly rounded than the base; front margin subtruncate; postero-dorsal margin nearly straight or slightly convex, and nearly parallel with the antero-basal margin; hinge short; ears of about equal size, small, but distinct, each forming an obtuse angle by the cardinal border, and the anterior and posterior borders respectively; beaks small, distinctly defined, projecting a very little over the cardinal border. Surface marked by numerous radiating costæ, which have interspaces of similar or slightly greater width between them; costæ becoming smaller upon each side of the umbonal region, and absent from the ears.

"The long diameter of the largest example contained in the collections is about 17^{mm}; short diameter, 14^{mm}."

Comparison of the Utah specimens above described with examples of Roemer's species from Texas shows that they are specifically distinct. *Lima utahensis* differs from *L. wacoensis* in the following particulars: In form it is considerably less oblique and proportionally more ventricose; the radiating costæ are more slender and less angulated, more uniform in size, more regularly arranged, and they never bifurcate in any of the specimens examined; it is a somewhat smaller species, though the valve now figured measures about one-fifth more than the dimensions above given.

The fact that *Lima wacoensis* occurs in the Comanche series associated with a fauna that is entirely distinct from that in which *L. utahensis* occurs is an additional reason for their separation.

Locality and position.—The types are from "southeast of Paria, Utah." The specimen figured in this bulletin was collected by Mr. C. D. Walcott in Upper Kanab valley, about 350 feet above the base of the Cretaceous section there.

PECTINIDÆ.

Genus CAMPTONECTES (Agassiz) Meek.

CAMPTONECTES PLATESSA White.

Pl. IX, Fig. 6.

Camptonectes platessa White, 1874, Expl. & Sur. West of 100th Meridian, Prelim. Rept. Invert. Foss., p. 25;—1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. IV, p. 176, Pl. 17, Fig. 5a.

Revised description:

“Shell thin, suborbicular in outline; length of hinge-line about equal to one-half the transverse diameter; ears well defined by auricular furrows; posterior ear short, flat, its outer margin slightly concave; anterior ear moderately large, marked by distinct lines of growth and obscure radiating striæ. The anterior ear of the right valve separated from the body portion by a deep, rather narrow, and somewhat angular sinus, the depth of which is equal to about one-half the length of the ear from its outer extremity to the beak. Radiating striæ of the surface moderately fine, increasing in number so rapidly that the direction of the outer ends of those above the middle of the valve is transverse, and farther toward the hinge they are distinctly recurving; the radiating lines crossed by fine concentric striæ, and occasionally by more distinct lines of growth.

“Height and transverse diameter each about 45 mm.

“This species somewhat resembles *C. bellistriata* Meek and Hayden from the Jurassic strata of Dakota; but is proportionally not so broad from front to rear, the ears are proportionally a little longer, and the radiating striæ a little coarser.

“*Locality and position.*—Strata of the Cretaceous period; 50 miles north of Camp Apache, and 5 miles west of Mineral Spring, Arizona.”

It also occurs about 350 feet above the base of the Cretaceous in Upper Kanab valley, and at the head of Water-pocket canyon, Utah.

AVICULIDÆ.

Genus AVICULA (Klein) Bruguière.

AVICULA GASTRODES Meek.

Pl. IX, Figs. 7-10.

Avicula (Oxytoma?) gastrodes Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 491.

Pteria (Oxytoma?) gastrodes White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 280, Pl. 10, Fig. 1a.

Pteria (Oxytoma) erecta White, 1880, Proc. U. S. Nat. Mus., vol. III, p. 157, and vol. IV, Figs. 7 and 8 of plate opposite p. 139.

Compare *Avicula caudigera* Zittel, 1866, Bivalven der Gosaugebilde, Pl. 12, Figs. 12a and 12b.

Original description:

“Shell (as determined from a left valve) attaining a moderately large size, subtrigonal in general outline, rather distinctly convex, and

having a very slight backward obliquity; basal outline very profoundly rounded, the deepest or most prominent part being in advance of the middle; posterior margin moderately sinuous below the wing, from the extremity of which it ranges obliquely forward and downward, rounding regularly into the base below; anterior margin strongly and subangularly sinuous under the wing, thence descending with a slight forward obliquity and rounding rather abruptly into the base; hinge margin longer than the height of the valve, the antero-posterior diameter of which (at any point below) it also decidedly exceeds, ranging nearly at right angles to the vertical axis of the shell; beaks distinctly convex, rising above the hinge margin, strongly incurved, without obliquity, and situated less than one-third the length of the hinge margin from the extremity of the anterior wing, which is subtrigonal in form, somewhat convex, a little rounded at the extremity, and very strongly separated from the abrupt shell of the umbo by a deep rounded concavity extending from the beak obliquely to the marginal sinus below; posterior wing longer and more compressed, narrower, and more angular than the other; both wings, particularly the posterior one, projecting decidedly beyond the margin of the valve below. Surface only showing more or less distinct lines of growth. (Right valve unknown.)

“Height of left valve, 1.50 inches; length of same below the wings, about 1.30 inches; length of hinge-line, 1.90 inches; convexity (of left valve alone), 0.40 inch.”

The types of *Pteria (Oxytoma) erecta* are small individuals that apparently belong to the same species. Dr. White's description is as follows:

“Shell rather small, appearing to be nearly erect, but the axis is slightly oblique to the hinge-line; both valves convex, but the right one less than the left; hinge-line long, much longer than the axial length of the shell; posterior wing large, its extremity acutely angular and moderately prominent; anterior wing comparatively large, prominent, obtusely pointed, defined from the body of the shell by a sinus or furrow in both valves, the direction of which forms a slightly obtuse or nearly right angle with the hinge-line; front, exclusive of the anterior wing, nearly perpendicular, the margin forming a nearly regular curve from the front all the way around to the posterior side, where it is flexed with a backward curve to meet the extremity of the hinge-line; umbones somewhat prominent, especially that of the left valve. Surface having a nearly smooth appearance, but the lens reveals the presence of somewhat regularly disposed concentric lines.

“Length of hinge-line, 32^{mm}; axial length of the shell, 26^{mm}. (Museum No., 8771.)

“This shell was formerly referred by me (loc. cit.) to the *Avicula linguiformis* of Shumard, but it differs from that species by having larger wings, a much longer hinge-line, and a much less oblique axis. It may be compared with *P. (O.) salinensis* White,¹ but it differs in being less

¹ Proc. U. S. Nat. Mus., vol. II, p. 296, Pl. 5, Figs. 1 and 2.

robust, having proportionally larger wings, narrower body, and a more nearly erect axis."

All the types are in the form of casts in sandstone and more or less distorted by pressure. In Huerfano park, Colorado, specimens were found that agree very well in form with the types, but some of them are very much larger. These retain portions of the shell, showing that it was unusually thick, especially in the umbonal region, and that the surface is marked by fine, closely arranged, concentric lines. Associated with these in the same bed there are other, smaller individuals that are much more oblique, some of which are scarcely distinguishable from some specimens of *Avicula linguiformis*. (See Pl. ix, Figs. 9 and 10.) But such specimens as that represented by Fig. 8 of the same plate are so nearly intermediate between the two extremes that I prefer to keep them for the present under the one name. *Avicula caudigera* Zittel, from the Cretaceous of Gosau, is a closely related species.

The largest specimen seen, a left valve, measures 73^{mm} in height and 61^{mm} in length just below the wings; greatest convexity of the single valve about 15^{mm}.

Locality and position.—The type came from the "second ridge" at Coalville, Utah, where it is associated with *Gervillia propleura*, *Pugnellus fusiformis*, etc.; the types of *Pteria erecta* were found at probably about the same horizon in Lower Potato valley, southern Utah, and the specimens now figured come from the Pugnellus sandstone in Poison canyon and on Williams creek, Huerfano park, Colorado.

Genus GERVILLIA Defrance.

GERVILLIA PROPLEURA Meek (sp.).

Pl. x, Figs. 1, 2, and 3.

Avicula (Pseudoptera) propleura Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 489.

Avicula (Pseudoptera) rhytophora Meek, 1873, *ibid.*, p. 490.

Pteria (Pseudoptera) propleura White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 281, Pl. 10, Figs. 2a, b, c.

Compare *Gervillia gregaria* Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 606.

Shell very inequivalve, more or less oblique, varying in outline from obliquely ovate-subtrigonal to rhombic-suboblong, nearly twice as high as wide; left valve moderately convex, with the greatest convexity toward the anterior side just below the beaks on the umbonal slope, which is here somewhat angular, but becomes broad and flat towards the basal margin; beak small, pointed, almost terminal and projecting but little beyond the hinge line; the small area in front of the beak rather abruptly depressed, forming a more or less distinct anterior auricle; posterior alation represented by a broad triangular flattened area, not distinctly defined from the body of the shell; hinge-line

straight, about as long as the greatest antero-posterior diameter, and forming an angle of 50° to 70° with the umbonal ridge; hinge area comparatively narrow, with five or six (or possibly more) large cartilage pits, each of which is nearly twice as broad as the space between them; posterior margin nearly straight in the middle, but curving slightly forward above, where it joins the hinge-line at an angle of 100° or more, while below it curves more sharply into the rather narrowly rounded base; anterior margin almost parallel with the posterior, slightly convex in outline; surface with more or less distinct lines of growth, which are crossed on the anterior part of the valve by several fine radiating lines and one or two stronger costæ that extend above the umbonal slope, giving it an angular appearance. These radiating lines are usually distinct on young individuals and become obsolete or disappear entirely on adult shells. Right valve known only by fragmentary casts, which show that it was flat and smooth and did not have a byssal notch.

Height of left valve of a large specimen, 87^{mm} ; length of the hinge-line, 52^{mm} ; convexity, 22^{mm} .

The types of this species, which was originally described under the two specific names cited above, came from the sandstones of the "first ridge" at Coalville, Utah, where the fossils are preserved in the form of casts that retain both the external and internal features to some extent without showing either very clearly. Afterward Dr. White obtained larger collections from the same place which enabled him to prove that the two forms are not specifically distinct. In my collections made in Huerfano park, Colorado, from about the same horizon there are several better preserved specimens, clearly belonging to the same species, in which the cartilage pits were observed, though the hinge can not be well figured from the material in hand. The transverse folds along the hinge-line, shown in one of the types, doubtless represent the cartilage pits as modified by pressure, though, of course, they do not show their form. Some of the casts show traces of two or three very oblique linear teeth below the pits. Traces of the same hinge structure are observable on some of the Coalville specimens. These facts are considered sufficient to justify the reference of the species to *Gervillia*. The published figure of *Gervillia gregaria* Shumard, which comes from approximately the same horizon in Texas, is very similar to small specimens of this species.

Locality and position.—Sandstones of the first and second ridges about 800 feet above the lower bed of coal at Coalville, Utah. It also occurs in the Pugnellus sandstone on Williams creek and Muddy creek, Huerfano park, Colorado, and I have collected the same species near the base of the Upper Cretaceous on the Chattahoochee river, 9 to 12 miles below Columbus, Ga.

Genus INOCERAMUS Sowerby.

INOCERAMUS FRAGILIS H. and M.

Pl. XI, Figs. 1-5.

- Inoceramus fragilis* Hall and Meek, 1856, Mem. Am. Acad. Arts. and Sci. n. s., vol. v, p. 388, Pl. 2, Fig. 6a and b; White, 1876, U. S. Geog. and Geol. Sur. west of 100th Meridian, vol. iv, p. 178, Pl. 15, Fig. 3; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 42, Figs. 1 and 2 in text and Pl. 5, Fig. 5; Meek, 1876, Macomb's Expedition from Santa Fé to junction of Grand and Green rivers, Geol. Rept., p. 127, Pl. 1, Fig. 6; Whitfield, 1880, Geol. Black Hills of Dakota, p. 390, Pl. 9, Fig. 10.
- Inoceramus howelli* White, 1876, Geol. Uinta Mts., p. 114; 1879, 11th Ann. Rept. U. S. Geol. Sur. Terr., p. 284, Pl. 4, Figs. 1a, b, c.
- Inoceramus perplexus* Whitfield, 1880, Geol. Black Hills of Dakota, p. 392, Pl. 8, Fig. 3, and Pl. 10, Figs. 4 and 5.

The original description and figures were taken from a small imperfect specimen in which the anterior border was mistaken for the hinge line. After studying better material from the same horizon and in part from the typical locality, Prof. Meek drew up the following description:

"Shell thin, broad-subovate, higher than long, moderately convex, subequivalve; anterior side vertically truncate from the beaks with a slightly concave outline; basal and posterior borders forming a more or less regular, nearly semicircular curve; hinge line rather short, and standing nearly at right angles to the truncate anterior. Beaks pointed equal, scarcely rising above the hinge, curving inward and slightly forward at the points. Surface marked by fine lines of growth, and a few obscure traces of concentric undulation.

"Height, about 1.43 inches; length, 1.07 inches."

The study of a considerable number of good specimens from Upper Kanab valley, southern Utah, and from Huerfano park, Colorado, in connection with the types of *Inoceramus perplexus* and *I. howelli* and the specimens of *I. fragilis* figured by Meek, have convinced me that these all belong to one variable species. The differences observed, however, are partly due to differences in the state of preservation. In some individuals the surface is almost smooth, even when the shell has attained considerable size, while others, such as the types of *I. perplexus*, are marked with very distinct concentric ridges. The variety to which the name *I. howelli* was given differs from the typical form in being slightly more convex and more inequivalve, in having a distinct posterior auriculation and a broad, shallow furrow on each valve extending from the umbonal region to the postero-basal margin, where it forms a slight emargination. Nearly all of the specimens from Huerfano park, Colorado, might be referred to this variety, but none of the features on which it is based are constant, so that in a large series every gradation between it and the typical form may be found.

Locality and position.—The original type came from near the mouth of Vermilion river, on the Missouri, at or near the base of the Fort Benton

group. It has also been found at about the same horizon near Fort Benton, Montana, in the Black hills of Dakota, and at the Vado del Chama, New Mexico. It occurs about 350 feet above the base of the Cretaceous section in the Upper Kanab valley, southern Utah; also in Lower Potato valley and on Ashley's fork, Utah; at the latter place in strata that were probably erroneously referred to the Fox Hills. It is abundant in the Pugnellus sandstone which caps the Benton shales in Huerfano park, Colorado.

INOCERAMUS LABIATUS Schlotheim.

Pl. x, Fig. 4; Pl. xiv, Fig. 2.

Ostracites labiatus Schloth., 1813, Bronn's Jahrb., vol. vii, p. 93.

Mytilites problematicus Schloth., 1820, Petrefactenk. i, p. 302.

Inoceramus mytiloides Mantell, 1822, Geol. of Sussex, p. 215, Pl. 28, Fig. 2.

†*Inoceramus confertim-annulatus* Schiel, 1855, Pacific R. R. Reports, vol. ii, Pt. 2, p. 108, Pl. 2, Fig. 7.

†*Inoceramus pseudo-mytiloides* Schiel, 1855, *Ibid.*, Pl. 3, Fig. 8.

Inoceramus mytiloides (Mantell) Roem., 1852, Kreide. von Texas, p. 60, Pl. 7, Fig. 5.

Inoceramus mytilopsis Conrad, 1857, U. S. Mexican Boundary Sur., vol. i, Pt. 2, p. 152, Pl. 5, Figs. 6a and 6b.

Inoceramus problematicus (Schloth.) Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 62, Pl. 9, Figs. 3 a and b.

Inoceramus aviculoides M. and H., 1860, Proc. Acad. Nat. Sci., Phila., p. 181.

Inoceramus problematicus var. *aviculoides* Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 63, Pl. 9, Fig. 4.

Inoceramus problematicus, *mytiloides* or *labiatus* of many authors.

The following is Meek's description of the species:

"Shell obliquely elongate-oval, subelliptical or ovate, nearly or quite equivalve, rather compressed, thin and fragile; anterior side forming a slightly convex curve from the beaks obliquely downward and backward; postero-basal extremity rather narrowly rounded; postero-dorsal margin very oblique, compressed, nearly straight, or sometimes a little convex in outline below the middle, and slightly concave above; cardinal border short, straight, compressed, and forming an angle of about 45 degrees with the longest diameter of the shell; beaks terminal, rather small, nearly equal, obtusely-pointed, rising little above the hinge, and not much incurved. Surface ornamented by more or less regular, concentric undulations, and smaller marks of growth.

"Greatest length, 4 inches; breadth, at right angles to the longest diameter, about 2 inches; convexity of the two valves, about 0.80 inch."

The name *Inoceramus aviculoides* was applied by Meek and Hayden to a variety with a longer hinge line, greater convexity and more prominent beak of the left valve, and with the dorsal region more alate than is usual in the species. After studying larger collections Prof. Meek found that there were many gradations between this and the typical form, and he therefore treated it as only a variety. Like all species of the genus, it is subject to considerable variation in form, yet it is

always easily recognized by its obliquely elongate outline and by the character of the surface markings.

It is unfortunate that the law of priority compels us to drop the name that has for many years been applied to this species by all American writers who have referred to it, and it is the more unfortunate because the species is so well known under that name as the most abundant characteristic fossil of the Colorado formation. There is no doubt, however, that the American fossil belongs to the species to which European paleontologists now apply the earliest name, *Inoceramus labiatus*.

Locality and position.—The species is common in the Niobrara limestone of Kansas, Nebraska, Colorado, and throughout the upper Missouri river region. It is also very abundant in calcareous layers of the Fort Benton shales wherever they occur in the same regions, and it is found in the equivalent strata in Utah, New Mexico, Texas, Northern Mexico, etc. In Europe the species is said to be confined to the Lower Turonian and in southern India it is found only in the Ootatoor group which forms the base of the Upper Cretaceous section of that region.

INOCERAMUS DIMIDIUS White.

Pl. x, Figs. 5 and 6.

Inoceramus dimidius White, 1874, Expl. and Snr. West 100th Meridian, Prelim. Rept. Invert. Foss., p. 25; 1876, U. S. Geog. and Geol. Sur. West of the 100th Meridian, vol. iv, p. 181, Pl. 16, Figs 2a, b, c, and d.

The revised description is as follows:

“Shell very small for one of this genus, inflated, sometimes much so, obliquely subovate in outline; valves subequal, the left one being a very little more capacious than the other; test thin; beaks small, prominent, acute, incurving, and pointing a very little forward; hinge-line straight or nearly so, rather short.

“Surface marked by more or less regular and more or less strong concentric folds or undulations. In some cases these undulations continued to be formed only until the shell had attained about half its full size, when they ceased, the remainder of the surface being marked only by ordinary concentric lines of growth. This irregularity in the formation of concentric folds is sometimes connected with considerable distortion of the usual symmetry of the shell.

“The long diameter of an average example from the umbo to the postero-ventral margin, 26^{mm}; greatest breadth, 18^{mm}; thickness, 16^{mm}.

“This species is especially distinguished by its small size. Its other more conspicuous specific characters are the small but prominent and pointed beaks and subequal valves. From the young of *I. problematicus*, the valves of which are also subequal, it differs in the character of the beaks just mentioned, the much greater convexity of the valves, and other evidences of mature growth.

“The collections contain quite a large number of examples of this

neat little species, both valves of which, in a majority of cases, are together in their natural position.

“*Position and locality.*—Strata of the Cretaceous period; Ojo del Piscado, New Mexico.”

This species is common at the base of Mesa Verde, near Mancos, Colo., where it occurs in the Colorado formation about 400 feet above its base, associated with *Prionocyclus macombi* and *Ostrea lugubris*. Some examples are much larger than the type, measuring 5^{cm}. in length. All the larger specimens are irregular and distorted in shape and with an almost smooth surface excepting near the beaks.

INOCERAMUS SIMPSONI Meek.

Pl. XII, Fig. 1.

Inoceramus simpsoni Meek, 1860, Proc. Acad. Nat. Sci., Phila., p. 312; 1876, Simpson's Expl. across Great Basin of Utah, p. 360, Pl. 4, Fig. 4; 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, pt. 1, p. 142, Pl. 13, Fig. 4; Whitfield, 1880, Geol. Black Hills of Dakota, p. 395, Pl. 8, Fig. 1.

Meek's description:

“Shell (right valve) attaining a rather large size, transversely oval-suboblong, gibbous, the greatest convexity being in the antero-central region, cuneate posteriorly; length nearly twice the height; anterior end very short and rounded from the beaks; base forming a long, semi-elliptic curve, most prominent near the middle and somewhat straightened, or even slightly sinuous, posteriorly; hinge-line long, straight, and ranging parallel to the longer axis of the shell; posterior margin subtruncated, with a slight backward slope above, and forming an abrupt curve into the oblique posterior basal margin; beaks depressed so as to project a little above the hinge-line, incurved, and placed nearly over the anterior margin. Surface ornamented with moderately distinct, regular, concentric undulations and lines of growth.

“Length, 8.10 inches; height, about 4.30 inches; convexity of right valve, nearly 2 inches.”

Locality and position.—The type specimen, and the only one that Meek examined, comes from “North Platte river, above Platte bridge, in Dakota Territory, from the Cretaceous formation No. 2 or 3 of the upper Missouri section.” The Dakota examples described by Whitfield are from the Old Woman fork in the Fort Pierre group, and from the east fork of Beaver creek, in probably the Fort Benton.

INOCERAMUS GILBERTI White.

Pl. XIV, Figs. 3 and 4.

Inoceramus gilberti White, 1876, Geol. Uinta Mts., p. 113; 1879, 11th Ann. Rept. U. S. Geol. Sur. Terr., p. 285, Pl. 3, Figs. 1 *a*, *b*, *c*.

The revised description is as follows:

“Shell irregularly suboval in marginal outline, the transverse diameter being greater than the vertical; front more or less flattened; valves

nearly or quite equal, the left one, if either, the larger, both of them gibbous, and sometimes quite ventricose; umbones broad and elevated; beaks very near the front, incurved, but not projecting beyond the front margin; front nearly straight vertically, or sometimes more rounded, in the former case forming nearly a right angle with the hinge; front margin rounded below to the basal margin, which is broadly convex for more than half the length of the shell; postero-basal margin extending obliquely upward, with a slight emargination, to the posterior extremity, which is abruptly rounded to meet the downward-sloping postero-dorsal margin; dorsal margin straight, its length equaling more than half the long diameter of the shell. Upon each valve there is an obscure radiating depression, or ill-defined furrow extending from the umbonal region to the postero-basal border, and ending there at the emargination before mentioned.

"Surface marked by the usual lines of growth, and also by numerous extravagant, irregular, concentric folds or wrinkles.

"This species belongs to a section of the comprehensive genus *Inoceramus* that Brongniart designated under the name *Catillus*. It is a peculiarly well-marked species and readily distinguishable from any other published species from American strata.

"Transverse length of an average-sized specimen, $7\frac{1}{2}$ cm; height from base to hinge, 5 cm.

"*Position and locality*.—Cretaceous strata, probably of the Fox Hills group; near Last Chance creek, southern Utah, where it was collected by Mr. G. K. Gilbert."

At the time the above description was written the author of the species referred to the Fox Hills group almost all of the Coalville section, a large part of which is now known to belong to the Colorado. In many respects this species resembles some examples of *Inoceramus flaccidus*, which certainly come from the Colorado formation. For these reasons it is now placed with doubt in the Colorado fauna.

INOCERAMUS FLACCIDUS White.

Pl. XIII, Fig. 1.

Inoceramus flaccidus White, 1876, U. S. Geog. & Geol. Sur. West of the 100th Meridian, vol. iv, p. 178, Pl. 16, Figs. 1a and 1b.

Original description:

"Shell large, irregularly subovate in marginal outline, exclusive of the ears, valves subequal, not much inflated; wing moderately large, well defined at its inner side by an auricular furrow; hinge line not very long, nearly at right angles with the front of the shell, and only a little oblique with the axis; a more or less distinct, but somewhat irregular furrow extending the whole length of the shell from the posterior side of the umbo to the postero-basal margin, giving each valve an obscurely bilobed appearance; crenulated face of the hinge narrow, crenulations

small; umbonal region narrow; beaks prominent, curved forward and inward; test comparatively thin throughout the whole shell, surface having the ordinary concentric lines of growth, and the test is also thrown into numerous rude and irregular concentric undulations.

“Length of the largest example in the collection, about 22^{cm}; greatest breadth, about 15^{cm}.

“This species is remarkable for the rudeness and extravagant irregularity of the undulations of the surface, of which irregularity the outline also partakes, giving the shell a flaccid aspect. The specimens of the collection are almost wholly in the form of natural casts, being preserved in a fine-grained calcareous sandstone, some of which is crowded with specimens of this species.

“*Position and locality*.—Strata of the Cretaceous period, 5 miles above Pueblo, Colorado.”

This species is not known from any other locality. The only American species resembling it in surface features is *Inoceramus gilberti* White, but the form is quite different in the type specimens.

INOCERAMUS UMBONATUS M. & H.

Pl. XVIII, Figs. 1 and 2.

Inoceramus umbonatus Meek and Hayden, 1858, Proc. Acad. Nat. Sci., Phila., p. 50; Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 44, Pl. 3, Figs. 1a, b, c, and Pl. 4, Figs. 1a, b, and 2a, b.

Compare *Inoceramus involutus* Sowerby, 1828, Min. Conch, vol VI, p. 160, Pl. 583.

Compare also *Inoceramus exogyroides* M. and H., 1862, *I. tenuirostratus* M. and H.; 1862, and *I. capulus* Shumard, 1860, Trans. St. Louis Acad. Sci., vol. I, p. 606.

Revised description:

“Shell attaining a rather large size, vertically subovate, extremely inequivalve; height more than one-third greater than the antero-posterior diameter; base regularly rounded; hinge and interior unknown. Left valve very convex; beak greatly elevated, gibbous, strongly and somewhat obliquely involute, so as to form one and a half to two entire turns, the point terminating near the anterior side; surface unknown, that of internal casts sometimes showing faint traces of concentric undulations. Right valve subcircular, or a little oval transversely, much compressed or nearly flat, excepting in the central and umbonal regions, which are moderately convex; beaks rather oblique, projecting little above the hinge, and but slightly incurved; surface (of an internal cast) ornamented with regular, rather prominent, sub-angular, concentric undulations, separated by wider rounded depressions.

“Height of left valve, about 7 inches; antero-posterior diameter, 5.10 inches; convexity, 4.50 inches. Right valve, height, about 5.70 inches; antero-posterior diameter, 5.10 inches; convexity, about 1.60 inches.

"I had at first remarked that this species is related to *I. involutus* of Sowerby, but I was not at that time aware how very closely it is allied to Sowerby's species. After a careful comparison of the additional specimens alluded to, with figures and descriptions of *I. involutus*, they are found to agree in so many respects that I would not be surprised if a comparison of specimens from these two distant localities should prove these shells to be specifically identical. The only differences that have thus far been discovered between them are the following: In the first place the antero-posterior diameter of *I. involutus* is less in proportion to the height of its left valve than in our Nebraska shell. Again, the aperture of its left valve is more nearly circular, being slightly higher than wide, while in the shell under consideration, it is somewhat oval transversely, being slightly wider than high. A more important reason, however, for regarding these shells as probably belonging to different species, is the fact that *I. involutus* occurs in France and England in the Upper or White Chalk, while our Nebraska shell comes from a formation we have reason to regard as equivalent to the Lower or Gray Chalk.

"From the same locality and position as those from which the species under consideration was collected, Lieutenant Mullan's party obtained another somewhat analogous species, which we have described in the Proceed. Acad. Nat. Sci. Phila. under the name of *I. exogyroides*. Like *I. umbonatus*, it has a very gibbous left valve, and probably a nearly flat right valve; but it will be readily distinguished by the much more depressed and oblique umbo of its left valve. This depression of the umbo gives it a nearly circular instead of a vertically oval outline.

"*Locality and position.*—Twenty miles below Fort Benton, on the Upper Missouri; from the Fort Benton group, or No. 2 of the Cretaceous series."

In this country the species has been found only at or near the original locality and in the Austin limestone of Texas. Dr. C. Schlüter¹ regards involute specimens as belonging to *I. involutus* and retains the name *I. umbonatus* for those (including *I. exogyroides*) in which the beaks are not coiled. He states, however, that as all three forms are associated in the same strata both in Europe and America, it will probably be found that the greater or less amount of coiling in the beaks is not an essential specific character. It should be stated that *I. involutus* occurs in Germany, in Schlüter's "Emscher Mergel" and in equivalent strata in other parts of Europe, at the base of Senonian, where it is associated with *Ammonites texanus* and *Ammonites tricarinatus*. The relative position of these analogous if not identical form, therefore, is not very different on the two continents.

¹ Palæontographica, vol. XXIV, p. 272.

INOCERAMUS EXOGYROIDES M. & H.

Pl. XVII, Figs. 1 and 2.

Inoceramus exogyroides Meek & Hayden, 1862, Proc. Acad. Nat. Sci., Phila., p. 26; Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 46, Pl. 5, Figs. 3a, b, c.

Revised description:

"Shell rather large; left valve suborbicular, its height being a little greater than its length from the anterior to the posterior side, very gibbous; anterior and posterior sides rounded, and forming with the base about three-fourths of a circle, the posterior curve being broader than the other; cardinal margin comparatively short, and apparently a little arched; beak large, elevated, gibbous, distinctly incurved and directed obliquely forward, so as to bring its point near the anterior margin; surface of cast smooth, or marked by obscure concentric undulations. (Right valve unknown.)

"Length from anterior to posterior margin, 5 inches; height, 5.50 inches; convexity, near 3 inches.

"No right valves of this species have yet been found; but, judging from the gibbous character and involuted beak of the left valve, it is probable that the right will be found to be much more compressed, so as to make the shell very distinctly inequivalve. The lateral curvature of the beak of the left valve, together with its general form, give it much the appearance of some species of *Exogyra*, as viewed from the inner side. Its aperture is transversely oval, the height being to the length about as four to five. Remaining portions of the shell show it to have been quite thick about the beak, and, as in other species, distinctly fibrous.

"Specifically, this shell differs from the last in being much more depressed and in having its left beak considerably less elevated and directed much more obliquely forward, as will be seen by comparing Fig. 3 a, Pl. 5, with Fig. 2 b, Pl. 4. It probably belongs, however, to the *Volviceramus* group.

"*Locality and position.*—Chippewa point, near Fort Benton, on the upper Missouri; from the same horizon as the last."

Larger collections will probably show that this is identical with *I. umbonatus*.

INOCERAMUS TENUIROSTRATUS M. & H.

Pl. XVI, Figs. 3 and 4.

Inoceramus tenuirostratus Meek & Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 27.

Inoceramus tenuirostris Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 59, Fig. 5 in text.

Revised description:

"Left valve very gibbous, subquadrate in outline; anterior margin very short or vertically truncated, with a slightly convex outline, immediately in front of the beak, and rounded into the base below; ventral

margin nearly semi-elliptical; posterior side rounded, or sometimes subtruncated, with a slightly convex outline above, and a little more prominent and rounding into the base below; hinge of moderate length, with cartilage furrows small, there being about five of them in a space 0.20 inch; beak very gibbous, prominent, narrowed, strongly incurved, and directed a little forward, its point being immediately over the anterior margin. Surface of internal cast smooth over the gibbous umbonal region, but showing traces of small, concentric undulations below the middle. (Right valve unknown.)

"Length, 2.10 inches; height from base to hinge, 1.82 inches; height to top of umbo, 2.13 inches; convexity of left valve, 0.90 inch.

"This shell has a more prominent, attenuated, and strongly incurved left beak than any other species of the *Catillus* group with which I am acquainted, being in this respect more like many species of typical *Inoceramus*, while its general form places it with the former section. No specimens of its right valve are yet known, but it is probably much less convex than the left; I know of no other species with which it is liable to be confounded.

"*Locality and position.*—Chippewa point, Montana; Fort Benton group."

This species is known only by the single type specimen, which is evidently somewhat distorted by pressure. I suspect that it is only an immature individual of *I. umbonatus*, although Prof. Meek placed it in a different subgenus.

INOCERAMUS UNDABUNDUS M. & H.

Pl. XVI, Figs. 1 and 2.

Inoceramus undabundus Meek & Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 26; Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 60, Pl. 3, Figs. 2a, b.

The following is quoted from the revised description:

"Shell obliquely rhombic-subovate or subquadrate, gibbous; anterior side very short, and rounding obliquely downward into the base; posterior basal extremity prominently rounded; posterior margin broadly rounded or subtruncated; dorsal and anterior margin diverging from the beaks at an angle of about 90° ; hinge short; beaks moderately prominent and nearly terminal, that of the left valve rather strongly incurved and directed obliquely forward, while in the right it is straighter and less elevated; umbonal axis ranging at an angle of about 70° to the hinge line. Surface of both valves (in the condition of casts) ornamented by regular, strong, subangular, concentric undulations, separated by wider, rounded depressions.

"Height from the most prominent part of the base to the hinge margin, 2.90 inches; height to top of umbo, 3.36 inches; convexity of left valve, 1.84 inches.

"The strong, subangular undulations, and gibbous, obliquely sub-

rhombic outline of this species, will readily distinguish it from all the other known forms of the genus in our rocks; and I know of no foreign species nearly enough related to it to render a comparison necessary. Both of its valves are quite convex, but the left one is rather decidedly more so than the right.

“One of the specimens of the right valve has its beak so nearly terminal and its anterior margin below it so straightened in outline as to present much the appearance of a typical *Inoceramus*; but as the others, as well as the left valve we have figured, have the anterior margin more prominent, it is probable that the straightness of the anterior outline in the single specimen mentioned may be, to some extent, due to accidental distortion.

“*Locality and position.*—Chippewa point on the Missouri, near Fort Benton; from the Fort Benton group of the upper Missouri Cretaceous series. Collected by Lieut. Mullan.”

INOCERAMUS DEFORMIS Meek.

Pl. XIV, Fig. 1; Pl. XV, Figs. 1 and 2.

Inoceramus deformis Meek, 1871, Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 296.

Haploscapha capax Conrad, 1874, Ann. Rept. U. S. Geol. Sur. Terr. for 1873, p. 456.

?*Haploscapha grandis* and *Haploscapha eccentrica* Conrad, 1875, U. S. Geol. Sur. Terr., vol. II, pp. 23 and 24, Pls. 66 and 67.

Inoceramus deformis White, 1876, U. S. Geog. and Geol. Sur. West one hundredth Meridian, vol. IV, p. 179, Pl. 15, Figs. 1a and b.

Inoceramus deformis Meek, 1877, U. S. Geol. Expl. Fortieth parallel, vol. IV. pt. 1, p. 146, Pl. 14, Figs. 4 and 4a.

Inoceramus —? Hall, 1845, Fremont's Rept. Expl. Rocky Mts., p. 310, Pl. 4, Fig. 2.

The following is Meek's description:

“Shell attaining a rather large size, obliquely ovate, and rather compressed in young examples, but more rounded, gibbous, and irregular, as well as much less oblique, in adult specimens; more or less inequivalve, but never very decidedly so; posterior and basal margins rounded; the latter curving up more gradually and obliquely to the short anterior margin; hinge short and usually not very oblique; beaks moderately prominent, and placed between the middle and anterior margin; neither greatly more elevated than the other. Surface ornamented with large, strong, concentric undulations, which are sometimes moderately regular, but often very irregular, and generally becoming rather abruptly smaller on the umbones, where their curves indicate the greater obliquity of the young shell.

“Height of a medium-sized specimen, about 4.50 inches; length of same, 4.30 inches; convexity of right valve, about 2.50 inches.

“I have frequently had under examination, during the last twelve years, specimens of this shell, without being able to identify them with any described species. Nearly all of the explorers who have visited the eastern slope of the Rocky mountains between the south branch

of the Platte river and New Mexico have brought in specimens of it, but almost always in a distorted or broken condition. Its distortion, however, is evidently not always due to accident, since it often resulted from one of the depressions between two of the undulations being so much larger and deeper than the others, as to give the valves a remarkably constricted appearance. In other cases it resulted, in part at least, from the great irregularity in the size of the undulations themselves. Although it is often found distorted in general form by accidental pressure, it was evidently also naturally quite variable in outline, particularly in convexity."

The name *Inoceramus deformis* was first used by Meek in a list without description, but with a reference to Hall's figure in Fremont's report. Conrad refers to the same figure in describing *Haploscapha capax*. His genus *Haploscapha* was based on specimens, probably belonging to this species, in which the surface of the shell was completely covered and cemented together by *Ostrea congesta* so that the interior only could be seen.

Inoceramus erectus Meek, from the upper portion of the Cretaceous section at Coalville, Utah, is closely related to this species, though it occurs at a much higher horizon. It seems, however, to be a more constant and regular form.

Locality and position.—Very common in the Niobrara limestone along the eastern base of the Front range in Colorado, *e. g.*, at Boulder, Morrison, Canyon city, Colorado Springs, near Pueblo, and in Huerfano park. In this region it seems to be confined to the Niobrara. It is also common in Kansas and Nebraska, and I have seen specimens that probably belong to this species from the Austin limestone, near Dallas, Texas.

INOCERAMUS CONRADI H. and M.

Inoceramus conradi Hall and Meek, 1856, Mem. Am. Acad. Arts. and Sci., n. s., vol. v, p. 387, Pl. 2, Figs. 5a and b.

This species is based on a single imperfect, crushed specimen which was obtained from the lower part of the Fort Benton shales on the Missouri, 5 miles below the mouth of Vermilion river. No other examples of it have been recorded, probably because well-preserved specimens could not be identified by means of the figure.

MYTILIDÆ.

Genus MODIOLA Lamarck.

MODIOLA (BRACHYDONTES) MULTILINIGERA Meek.

Pl. XIX, Fig. 3.

Modiola (Brachydontes) multilinigera Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 492.

Folsella (Brachydontes) multilinigera White, 1880, Cont. to Paleontology Nos. 2-8, p. 14, Pl. 12, Figs. 15a and b. < Ann. Rept. U. S. Geol. Sur. Terr. for 1878.

Compare *Modiola tenuisculpta* Whiteaves, 1889, Cont. to Can. Paleontology, vol. i, p. 188, Pl. 26, Figs. 2 and 2a.

Original description:

“Shell rather above medium size, obliquely arcuate-subovate; valves strongly convex along the umbonal slopes, thence cuneate posteriorly, and abruptly curved inward below the middle in front; posterior margin forming a broad, regular, convex curve, from the end of the hinge downward to the anterior basal extremity, which is very narrowly and abruptly rounded; anterior margin ranging obliquely backward and downward to the narrow basal extremity, and strongly sinuous along the middle, above which it projects more or less beyond the umbonal ridge, so as to form a moderately prominent, somewhat compressed protuberance; hinge margin nearly or quite straight, running at an angle of 50° to 60° above an imaginary line drawn from the beaks to the most prominent parts of the basal outline, and equaling about half the greatest oblique length of the valves; beaks nearly terminal, rather compressed, very oblique, and scarcely rising above the hinge margin; umbonal slopes prominent and more or less strongly arcuate. Surface ornamented by fine lines of growth, crossed by regular radiating lines that are very fine and crowded on the anterior part of the valves, but become coarser above and behind the umbonal ridge, the largest being near the dorsal side, where they bifurcate so as to become very fine, and curve more or less upward before reaching the cardinal margin.

“Greatest length, measuring obliquely from the beaks to the most prominent part of the basal margin of a large specimen, 1.90 inches; greatest breadth at right angles to the same, 1 inch; convexity, 0.76 inch.

“On first examining some imperfect casts of this shell, brought by Dr. Hayden from near Coalville, Utah, I was led to think it probably the form described by Dr. Roemer from Texas, under the name *Modiola pedernalis*, to which I referred it provisionally, in making out the list of Cretaceous fossils for Dr. Hayden's report of 1870. Further comparisons of better specimens collected during the past summer at the same locality, however, have satisfied me that it presents well-marked and constant differences from the Texas shell. In the first place, it is distinctly more arcuate, so much so, that when placed with its hinge line in a horizontal position, the outline of its posterior margin, instead of forming an oblique backward descending curve, ranges nearly vertically. Again, the most prominent part of its posterior basal margin is very narrowly rounded, instead of forming a regular curve. Its umbonal ridges are likewise more prominent, more arched, and extend down to the narrowly rounded posterior basal extremity. The lobe-like projection of the upper part of its anterior margin, under the beak and in front of the umbonal ridge, also differs in being proportionally much smaller than Dr. Roemer's species, in which it forms about one-third of the entire valve, as seen in a side view, while in our shell it scarcely

forms more than one-sixth. Of course the specimens are more or less variable in these characters, but the two forms can always be readily distinguished when good examples can be had for comparison.

"In its more arcuate form our shell agrees more nearly with *Modiola ornata* Gabb, from the Cretaceous rocks of California; but that shell differs very markedly in having its beaks decidedly less nearly terminal, and a more decided and much more prominent lobe in front of them. Another important difference is to be observed in the radiating striæ, which, on the anterior side of our shell are very minute and closely crowded, while on that part of Mr. Gabb's species they are as large and distant from each other as on any other part of the valves."

Whiteaves states that *Modiola tenuisculpata* is very closely related to Meek's species, and as it comes from approximately the same horizon in Manitoba it will probably prove to be a synonym.

Locality and position.—The types came from the lowest fossiliferous bed of the Cretaceous section at Coalville, Utah, where it is abundant. It also occurs at a much higher horizon in the "third ridge" of the same section and at several localities in southern Utah. It is common in the Colorado Cretaceous beds at Bear River city, Wyoming, and the same or a closely related species has been found in the Bear River formation on Twin creek, Wyoming.

PINNIDÆ.

Genus PINNA Linnæus.

PINNA PETRINA White.

Pl. XIX, Fig. 4; Pl. XX, Fig. 1.

Pinna petrina White, 1874, Expl. & Sur. West of 100th Meridian, Prelim. Rept. Invert. Foss., p. 24; 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. iv, p. 182, Pl. 13, Figs. 7a and b.

Pinna stvensoni White, 1880, Proc. U. S. Nat. Mus., vol. iii, p. 47.

Revised description:

"Shell moderately large, broad, rather thick, rapidly expanding in height as it increases in length; dorsal margin concave; ventral margin convex; a more or less strongly-raised carina extending from the beak to the posterior margin, defining a prominent longitudinal angle along the median portion of each valve, which is placed a little nearer the ventral than the dorsal border; transverse section rhomboidal, the sides of the rhomb slightly convex; posterior margin oblique with the axis of the shell, forming a distinct but obtuse angle with the dorsal margin. The acute angle which it would form with the ventral margin if continued all the way to it in a direct course is abruptly rounded.

"Surface marked by strong, distinct lines of growth, which run obliquely downward and backward in a nearly direct course from the dorsal margin, across the mesial angle, to near the ventral margin, where

they are abruptly flexed forward, and blend with the ventral border. Crossing the lines of growth upon the surface above the mesial angle, there are coarse but indistinct radiating striæ, and occasionally still more indistinct traces of similar ones below that angle, all of which are more discernible upon the anterior than upon the posterior part of the shell. More or less of the test is preserved upon all the specimens; but no trace of the pearly layer has been detected, all the test having the usual prismatic structure.

“Some of the largest examples measure $7\frac{1}{2}$ cm in width along the posterior margin, and they must have been not less than 17 cm in length when entire. The large size, proportionally great width, and angular aspect of this shell distinguish it from any other likely to be confounded with it. It resembles *P. renauxiana* d'Orbigny, as figured by him in *Paléontologie Française*, but it expands much more rapidly in width than that species does, is not proportionally so thick, and has a very different posterior marginal outline. In that shell it is the middle of the posterior margin that is most extended, while in ours the greatest extension is much below the middle.

“*Position and locality.*—Strata of the Cretaceous period; east of Mount Taylor, 1 mile south of Pajuate, New Mexico.”

The type of *Pinna stevensoni*, which was found near Fort Wingate, New Mexico, only a few miles from the typical locality of *P. petrina*, seems to be only an unusually large specimen of the latter species. The absence of the anterior portion, which is always more angular and often bears radiating lines, gives this specimen an unusual aspect.

The exact position of the beds from which the types came is not known. The species is not uncommon in the Pugnellus sandstone of Huerfano park, Colorado, and a few examples were found in the Benton shales on the Arkansas river, 20 miles above Pueblo, Colorado. A *Pinna* occurs in the sandstone of the “second ridge” at Coalville, Utah, that may be this species.

ARCIDÆ.

Genus BARBATIA Gray.

BARBATIA MICRONEMA Meek (sp.).

Pl. XXI, Figs. 1-4.

Trapezium micronema Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 493.—

White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 293, Pl. 10, Fig. 5.

Arca? coalvillensis White, 1876, Geol. Uinta Mts., p. 115.

Barbatia coalvillensis White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 286, Pl. 6, Figs. 2a and b.

The type of this species is a cast of both valves on which the surface markings are partially preserved, but it is broken and distorted by pressure, so that the generic features are obscured and the outline is not complete. This specimen is from Cretaceous coal-bearing sand-

stones at Bear River city, Wyoming, and Prof. Meek recognized the species in sandstone near the base of the section at Coalville, Utah, in the same layers from which the types of *Barbatia coalvillensis* were obtained. A study of all these types and of large collections from the same localities has convinced me that they belong to a single species, and that the smaller shells called "*Macrodon* (undetermined sp.)" by Meek are the young of the same species.

White's revised description of the Coalville specimens is as follows:

"Shell not large, moderately gibbous, transverse length from two-fifths greater to nearly twice as great as the height; beaks depressed, situated near the anterior end; umbones broad, not prominent; anterior end rounded or subtruncate; base usually nearly straight, but sometimes slightly convex and sometimes a little emarginate about the midlength; postero-basal border rounded upward to the posterior extremity, which is abruptly rounded up to the downward sloping, nearly straight postero-dorsal border, the latter forming a rounded obtuse angle with the cardinal border; hinge equal in length to about two-thirds the entire length of the shell, consisting of a moderately slender hinge plate bearing numerous transverse teeth with about equal spaces between them. The posterior teeth have an oblique direction downward and a little forward, which obliquity diminishes towards the front, so that the teeth from about midlength of the hinge to the center of the beak are directly transverse. These central transverse teeth are a little narrower than those farther back, but the two or three teeth in front of the center of the beak are larger than any of the others, and a little curved.

"Area apparently nearly obsolete, or at least it is very narrow. Internal markings unknown. A slight depression or flattened space upon the outer surface extends from the umbo of each valve to its base, meeting there the straight or slightly emarginated portion of the basal margin before mentioned.

"Surface marked by the ordinary lines of growth and also by fine radiating lines, which are often obscure.

"Length of an example a little above the ordinary size, 5^{cm}; height, 33^{cm}."

Additional material from the original locality shows that in adult shells the hinge line is curved downward at each end and in these curved portions the teeth are large, slightly curved, and oblique to the hinge line, those at the extreme ends, especially the anterior one, becoming almost parallel with it. The medial portion of the hinge is not so well preserved in any of the specimens, but there are obscure impressions of small, closely arranged, transverse teeth. The ligamental area is narrow, with two or three well-defined grooves, posterior to the beak and nearly parallel with the hinge. These features are all made out from casts and impressions in sandstone.

In the Timber Creek beds, near Lewisville, Denton county, Texas,

Prof. W. F. Cummins and Dr. C. A. White some years ago obtained large numbers of well preserved shells which I believe to belong to this species. At any rate, the characters that are preserved in the Coalville specimens agree in every particular with those from Texas, figures of which are given for comparison.

The species attains a considerably larger size than is indicated by the dimensions above given.

Locality and position.—Abundant near the base of the Cretaceous section at Coalville, Utah, and occasionally found much higher in the same section in the lower part of the "third ridge"; also in equivalent strata at Bear River city, Wyoming. The Texas specimens come from the Timber Creek beds of Denton county, near the base of the Upper Cretaceous section of that region.

Genus NEMODON Conrad.

NEMODON SULCATINUS Evans & Shumard (sp.)?

Pl. XXI, Fig. 5.

Arca sulcatina Evans & Shumard, 1857, Trans. St. Louis Acad. Sci., vol. I, p. 39.

Nemodon sulcatinus Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 82, Pl. 15, Fig. 6.

Shell small, transversely elongate, ventricose, basal margin parallel to the dorsal, nearly straight, but slightly sinuous in the middle; front broadly rounded from the base to the hinge line, which it joins nearly at a right angle; posterior end obliquely truncate, strongly sinuous above the middle, and narrowly rounded into the base below; beaks slightly in advance of the middle, prominent, incurved, and rather distant; posterior umbonal slope oblique, narrowly rounded. A narrow, deep sulcus, almost at right angles to the hinge, runs from the beak to the middle of the base. Surface of the casts with faint radiating striæ, and the free margins crenate. A natural mold of the surface of the shell shows about 25 fine radiating lines.

Length, 6^{mm}; height, 3^{mm}; convexity of one valve, about 1.6^{mm}.

The specimens here described are a few small casts, the largest of which is figured, collected by Mr. C. D. Walcott in the lower part of his Upper Kanab valley Cretaceous section, where it is associated with many species of the Colorado fauna. The types of the species came from near Grand river, Dakota, and the only other reported locality is on the Yellowstone river, 150 miles above its mouth, where it is associated with species belonging to the Montana formation. The Kanab specimens show slight differences when compared with those from the Yellowstone, and it is possible that better material will show that they are really distinct; but the general resemblance is very close, and I think it best to call them by the same name for the present.

Genus TRIGONARCA Conrad.

TRIGONARCA OBLIQUA Meek.

Pl. XIX, Fig. 1; Pl. XX, Figs. 2-6.

Cucullæa (*Trigonarca*?) *obliqua* Meek, 1877, U. S. Geol. Expl. Fortieth Parallel, vol. IV, pt. I, p. 148, Pl. 14, Figs. 1, 1a, b.

Original description:

"Shell attaining about a medium size, rhombic-subovate, moderately convex, the greatest convexity being along the posterior umbonal slope, while the anterior ventral region is abruptly cuneate; anterior margin rounded in outline; base with a shallow semiovate outline, being usually slightly more prominent in advance of the middle; posterior margin long and very obliquely truncated, with a slightly convex outline from the hinge to the posterior basal extremity, which is prominent and subangular; hinge margin very short, or little more than equaling one-third the length of the valves; posterior umbonal slope prominent, and more or less angular from the beaks to the posterior basal angle; cardinal area short and rather narrow; beaks moderately prominent, incurved, and placed one-fourth to one-third the length of the valves from the anterior margin. Surface ornamented by moderately distinct lines of growth, crossed by obscure radiating costæ that are wider than the mere linear furrows between.

"Length, 1.50 inches; height, 1 inch; convexity, about .70 inch."

This description was based on sandstone casts that retain the surface markings to some extent and at the same time show more or less of the internal features.

The collections from several localities in Huerfano park, Colorado, contain numerous well preserved specimens of this species, which show that the surface is usually marked only by lines of growth, and that the obscure radiating costæ above described are on the interior of the shell, and therefore preserved on internal casts. A few of the smaller specimens show obscure radiating lines on the surface, and especially on the umbonal ridge. There is considerable variation in outline, some specimens having almost the form of *Ideonarca depressa* White. These two species seem to be more closely allied than one would think from the examination of the types alone, but they are probably distinct. The ligamental area is depressed, triangular, with five or six divaricate cartilage furrows. Hinge line curved as in *Pectunculus* with subequal transverse teeth, some of which toward the posterior end are slightly larger and curved. Both muscular impressions are bordered by elevated ridges, the posterior one being much the stronger. In all these generic features *Trigonarca obliqua* agrees with the forms on which Conrad founded the genus, and specifically it is very closely allied to *T. triquetra* Conrad, from the Cretaceous of North Carolina.

Locality and position.—The types were collected in Cretaceous sand-

stones on East canyon creek, Wasatch range, Utah. The species has been found near the base of the Cretaceous section at Coalville, Utah, and it is common in the Pugnellus sandstone on Williams and Muddy creeks, and in Poison canyon, Huerfano county, Colorado.

TRIGONARCA DEPRESSA White (sp.)

Pl. XIX, Fig. 2.

Idonearca depressa White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 183, Pl. 18, Figs. 13a, b.

Original description:

“Shell of moderate size, gibbous, irregularly trapezoidal or subovate in marginal outline; posterior half of the basal margin nearly straight, broadly rounding upward anteriorly, and sharply rounding the end of the umbonal ridge to meet the posterior margin; anterior margin regularly rounded up to the hinge-line; posterior margin long, about equal in length to the full height of the shell, nearly straight or slightly convex, extending obliquely downward and backward; hinge line equal to a little more than half the length of the shell; areas small, narrow, well defined, slightly concave; beaks very small, depressed, a little incurved; umbonal ridges very prominent, each bounding anteriorly a flattened, three-sided space, along the middle of which there is a radiating, raised line.

“Surface marked by the usual lines of growth and also by numerous small, flat, radiating costæ of unequal width, with narrow, sharply impressed interspaces between them; costæ largest upon and near the umbonal ridge, becoming obsolete near the cardinal border, anteriorly and posteriorly.

“Length, measuring across at about midheight of the shell, 28^{mm}; height, from base to umbo, 23^{mm}; thickness, both valves together, about 20^{mm}.

“This species is not fully represented in the collections, but its specific characters are very satisfactorily shown. A full collection of examples would probably show variations of outline, due to sex, in some cases, whereby the aspect of the shell may be a little different from that of the figure. It is perhaps as nearly related to *I. Shumardi* Meek and Hayden as to any other described species, but it is clearly distinguished from that by its depressed beaks and prominent umbonal ridges.

“*Position and locality.*—Strata of the Cretaceous period; east bank of Rio Puerco, 6 miles below Casa Salazan, New Mexico.”

The species associated with this at the typical locality belong to the Colorado fauna. I have no doubt that it is generically related to *Trig-onarca obliqua* and additional collections may show that it is still more closely allied to that species.

NUCULIDÆ.

Genus NUCULA Lamarck.

NUCULA COLORADOENSIS n. sp.

Pl. XXI, Fig. 9.

Shell small, transversely ovate subtrigonal, moderately convex; dorsal margin in front of the beak slightly convex, declining to the subangular anterior end; posterior end very short, truncate almost at right angles to the dorsum; basal margin forming a regular curve, finely crenate within; beak rather prominent, incurved, very near the posterior end of the valve. Surface marked by faint, closely arranged radiating lines and by large irregular concentric ridges and lines of growth.

Length, 12^{mm}; height, 10^{mm}; convexity of single valve, 3^{mm}.

Only a single well preserved valve of this little shell was found, and, not being able to identify it with any of the described Cretaceous species from the Rocky mountain region, I have thought it best to give it a provisional name. The fact that the most nearly related forms come from a much higher horizon renders it more probable that this is a distinct species. In form it is similar to both *Nucula planimarginata* M. & H. and *Nucula cancellata* M. & H., but the posterior end of our species is proportionally much shorter and there are other slight differences in outline. In surface ornamentation it is more nearly like *N. planimarginata*, but its crenate inner margin would prevent its identification with that species.

Locality and position.—On Williams creek, Huerfano park, Colorado, in concretions near the base of the Fort Benton shales, associated with *Crassatella excavata*.

Genus YOLDIA Möller.

YOLDIA SUBELLIPTICA n. sp.

Pl. XXI, Figs. 6 and 7.

Shell small, thin, transversely elongate subelliptical in outline, moderately convex in the umbonal region, depressed towards the extremities; dorsal margin declining slightly and equally in both directions from the beaks; both ends of the shell subangular above and broadly rounded below; basal margin almost straight; beaks rather prominent, tumid, situated a little behind the middle.

Surface marked by minute concentric lines. Hinge and interior features unknown.

Length, 7^{mm}; height, 4^{mm}; greatest convexity of both valves united, 8^{mm}.

Not having seen the hinge of this species I am not certain that it belongs to the genus to which it is provisionally referred.

Locality and position.—In the Pugnellus sandstone, Poison canyon, Huerfano park, Colorado. Only one specimen has been found.

TRIGONIIDÆ.

Genus TRIGONIA Bruguière.

TRIGONIA ———?

Trigonia——Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, pp. 474, 475.

A few imperfect specimens of a *Trigonia* allied to *T. evansana* Meek have been collected at Cinnabar mountain and near Gallatin city, Montana. The specific characters are not sufficiently well preserved to be described. It is remarkable that these are the only specimens of *Trigonia* reported from the Upper Cretaceous of the north interior region. The genus is well represented in the beds of the same age in the Atlantic and Gulf border regions from New Jersey to Texas, and also on the Pacific coast.

UNIONIDÆ.

Genus UNIO Retzius.

UNIO ———?

Pl. XXII, Fig. 1.

Fragments of *Unio* are not uncommon, associated with the coal beds near the base of the Colorado formation in southern Utah. One of the best preserved specimens obtained at Glendale, Utah, is figured. This form, which is abundantly represented there by fragments and casts, seems to be distinct from all the described Cretaceous species, though the material in hand is hardly sufficient to characterize it. It is a rather slender, compressed form, its outline broadly lanceolate. The beaks, which are not very prominent, are situated one-third to one-fourth the length of the shell from the anterior end. The cardinal and basal margins are subparallel, the anterior end regularly rounded, and the posterior end more narrowly rounded or subtruncate. The surface is smooth, excepting the posterior third, which is marked by two obscure radiating folds or plications. Length of the figured specimen, 66^{mm}; height, 26^{mm}. Some of the fragments belonged to shells nearly twice as large as this.

SOLEMYIDÆ.

Genus SOLEMYA Lamarck.

SOLEMYA? OBSCURA n. sp.

Pl. XXI, Fig. 8.

Shell small, thin, elongate, subcylindrical; ventral and dorsal margins nearly parallel; anterior? end regularly rounded; posterior? end contracted immediately behind the beak, rather narrowly rounded; beak broad, incurved, not very prominent, situated near the posterior?

end. Surface ornamented with faint lines of growth and very obscure, distant, radiating lines that are preserved only on the anterior? portion.

Length, 15^{mm}; height, 6^{mm}; greatest convexity of single valve, about 2^{mm}.

The type is a single valve, retaining only a portion of the shell. As neither the hinge nor the pallial line has been seen, its generic reference is only provisional.

Locality and position.—In the Pugnellus sandstone, Poison canyon, Huerfano park, Colorado.

CRASSATELLIDÆ.

Genus CRASSATELLA Lamarck.

CRASSATELLA EXCAVATA n. sp.

Pl. XXI, Figs. 10-13.

Shell small, depressed subquadrate in outline; dorsal margin nearly straight, declining slightly from the beak to the posterior end, which is truncate almost vertically; front slightly concave above for over half the distance from the beak to the base and regularly curved below; ventral margin forming a broadly ovate curve; lunule broadly lanceolate and very deep; escutcheon long and well defined, but not nearly so deep as the lunule; beaks near the anterior end, small, pointed, approximate, and directed forward. Posterior to the umbonal slope, which is broadly rounded and not very well defined, the shell is compressed. Surface marked by fine lines of growth and by narrow, subequal, somewhat irregularly arranged, concentric ridges.

The hinge has the structure characteristic of the genus and the free margin of the shell is crenate. Represented by three well preserved valves.

Length, 16^{mm}; height, 15^{mm}; convexity of one valve, 4^{mm}.

The most nearly related species with which I am acquainted is *Crasatella cimarronensis* White, which has nearly the same outline when viewed from the side, but it differs from the present one in its greater convexity, larger size, and in the character of its surface. Its lunule is proportionally much more shallow and its hinge is broader and stronger.

Locality and position.—From concretions in the Fort Benton shales on Williams creek, Huerfano park, Colorado.

RUDISTÆ.

Genus RADIOLITES Lamarck.

RADIOLITES ———?

A single fragment of a large species of *Radiolites*, or *Sphærulites* has been collected by Mr. Edwin Blackburn in the Niobrara limestone at Morrison, near Denver, Colorado, and I have seen a similar specimen,

probably from about the same horizon, that was found near Canyon city, Colorado.

The specimen from Morrison is a part of the thick outer layer of the lower valve. It shows the characteristic structure of *Radiolites*, consisting of large prismatic cells arranged in layers parallel with the upper surface of the shell, and the surface of each layer showing impressions of a few slender, branched, radiating ridges on one side and corresponding furrows on the other. A little of the outer surface of the shell is preserved, showing narrow longitudinal ridges and grooves each about a millimeter wide. The individual to which this fragment belonged must have been 6 or 8 inches in diameter. The shell substance is over 2 inches thick.

Compared with *Radiolites austinensis* Roemer, which occurs in the equivalent of the Colorado formation in Texas, this specimen seems to have narrower ridges and grooves on the outer surface, while the prismatic cells of the thick shell are larger. It is doubtful, however, whether these differences are of specific importance, and I think it probable that better material will show that the Colorado specimens belong to *R. austinensis*.

Large specimens of "*Hippurites*" probably belonging to this genus have been reported from the Niobrara beds of Kansas.

LUCINIDÆ.

Genus LUCINA Bruguière.

LUCINA SUBUNDATA H. & M.

Pl. XXII, Figs. 5 and 6.

Lucina subundata Hall and Meek, 1856, Mem. Am. Acad. Arts and Sci., vol. v (n. s.) Pl. 1, Fig. 6; White, 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. iv, p. 184, Pl. 18, Fig. 12a; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 133, Pl. 17, Figs. 2a, b, c, d, e; Whitfield, 1880, Geol. Black Hills of Dakota, p. 411, Pl. 11, Figs. 17 and 18.

The following is Meek's description:

"Shell small, subcircular, compressed, very thin; anterior side broadly rounded; basal margin semiovate, the most prominent part being toward the front, more or less contracted behind, smooth within; posterior side narrower than the other, and usually subtruncate at the extremity; dorsal margin concave in outline just before and convex just behind the beaks, which are rather prominent, pointed, and nearly central. Surface ornamented by small concentric undulations and very small parallel striæ, which are sometimes crossed by obscure traces of very fine, nearly obsolete, radiating striæ.

"Length, 0.42 inch; height, 0.32 inch; convexity, 0.12 inch.

"This little shell evidently varies much in form, some specimens

having the anterior portion of the ventral margin much more prominent and the posterior side more contracted than others. Generally there is an obscure depression extending obliquely backward and downward from the posterior side of the beaks, and a stronger one passing from the front side of the beaks to the upper part of the anterior margin. Sometimes both of these impressions are obsolete, while in other cases they are quite distinct, and there seem to be all gradations between."

The specimens now under consideration, two of which are figured, are in the form of casts retaining only small portions of the shell. They seem to agree in every respect with the types of the species, although they come from a much lower horizon.

Locality and position.—About 350 feet above the base of the Cretaceous section in Upper Kanab valley, Utah, where it is associated with many species characteristic of the Colorado formation. Those described by Dr. White came from probably the same horizon southeast of Paria, Utah, and it occurs in the lower part of the Coalville section. The types and all the other described specimens above referred to were collected in the upper part of the Fort Pierre shales on Cheyenne river, South Dakota.

LUCINA JUVENIS n. sp.

Pl. XXII, Figs. 2-4.

Compare *Lucina subundata* M. & H.

Shell small, relatively thick, moderately convex, subcircular in outline; beaks small, central, approximate; dorsal margin slightly concave in front of the beaks and convex behind them; posterior end subtruncate, the rest of the outline forming a regular curve. A narrow posterior portion of the shell is considerably depressed. Surface marked by distinct regular concentric undulations, each of which is about half as broad as the intervening furrows. More numerous fine lines of growth are visible under a lens. Length of the largest specimen, 6.4^{mm}; height, 6^{mm}; convexity of the two valves united, about 3^{mm}.

The specimens above described are not easily distinguishable from young individuals of *Lucina subundata*, and if they had been found associated with that species they probably would not have been separated. Several examples were collected, all of about the same size, and no larger shells of the genus were found in the same beds with them.

Comparison with the types of *L. subundata* and with the fossils from southern Utah that are referred to the same species, show that this little shell has relatively less prominent beaks, its outline is more nearly circular, and the concentric undulations are proportionally larger.

Locality and position.—In the Pugnellus sandstone near Malachite post-office and in Poison canyon, Huerfano park, Colorado.

CARDIIDÆ.

Genus CARDIUM Linnæus.

CARDIUM PAUPERCULUM Meek.

Pl. XXII, Figs. 9-12.

Cardium pauperculum Meek, 1871, Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 306; White, 1879, idem for 1877, p. 291, Pl. 9, Fig. 3a.

Cardium subcurtum Meek, 1873, idem for 1872, p. 476; 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, p. 152, Pl. 15, Fig. 3a.

Original description:

“Shell small, very thin, rather compressed, subovate or subcircular; beaks moderately prominent and nearly central; surface ornamented by about thirty regular, simple, distinctly defined, radiating costæ, which about equal the intermediate furrows, and (owing to the thinness of the valves) are well defined internally, and thus impart a plicated or crenated character to the margins; crossing these are numerous very regular, well-defined, delicate marks of growth that are usually less distinct on the posterior third, but give a neatly crenulated appearance to the costæ further forward.

“The specimens yet seen of this little shell are rarely more than about 0.50 inch in diameter, and are all more or less flattened or otherwise distorted. Sometimes they are distorted by antero-posterior pressure, so as to present somewhat the appearance and outline of a *Lima*, being higher than wide, and more or less oblique, while in other examples they are distorted by vertical pressure, so as to present little or no obliquity, and to show a greater antero-posterior diameter than height. I have not seen the hinge, but some impressions in the matrix show that it has anterior and posterior lateral teeth like those of *Cardium*; it, however, does not belong properly to the typical section of that genus.”

The types are distorted internal casts and molds of the surface, some of which show the natural form, and Meek's figure published by White (loc. cit.) is an incorrect restoration. The comparison of a large series of specimens in all states of preservation has fully established the identity of *Cardium subcurtum* with *C. pauperculum*. The sandstone casts to which the former name was given were thus described:

“Shell under medium size, truncato-suborbicular, about as high as wide, rather convex, and but very slightly oblique; beaks nearly central, rather prominent, distinctly incurved almost at right angles to the hinge; posterior margin truncated with a slight forward obliquity, so as to connect with the dorsal margin at an obtuse angle; anterior margin rounding regularly into the base, which describes a slightly oblique semiovate curve, being more prominent behind, where it rounds up very abruptly to the posterior margin, so as to give a subangular outline to the posterior basal extremity; umbonal slopes rather prominent,

but not angular; hinge margin shorter than the length of the valves. Surface ornamented by small, regular, simple, radiating costæ, and moderately distinct lines of growth."

The costæ vary in number from thirty to thirty-five and three or four of those on the posterior umbonal slope are more elevated, more angular, and farther apart than the others, giving that region of the shell an angular appearance when they are not eroded.

Some specimens are nearly circular in outline, the height and length being equal, but in most cases the height from beak to ventral margin is greater than the length or antero-posterior diameter.

The specimens selected for illustration are somewhat smaller than the average size. One from Huerfano park, Colorado, measures 14^{mm} in length, 16^{mm} in height, and the convexity of the single valve is 6^{mm}. A few examples have been collected that are considerably larger.

Locality and position.—The types are from dark fissile shales near the lower part of the Colorado formation, 20 miles west of Fort Bridger, Wyoming. It is abundant at the same horizon on Sulphur creek, Wyoming, and occurs in the coal-bearing sandstones at that locality. The types of *Cardium subcurtum* were collected in the sandstone of the "second ridge" at Coalville, Utah, and it is found near the base of the same section; also in the Pugnellus sandstone at several localities in Huerfano park, Colorado.

CARDIUM TRITE White.

Pl. XXII, Figs. 7 and 8.

Cardium trite White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 291, Pl. 5, Figs. 4a and b.

Original description:

"Shell broadly subovate or suborbicular, height and width about equal; valves gibbous, regularly arching from beak to base; median portion regularly convex; sides a little flattened above the middle; rostral portion narrowed, elevated, arched; beaks situated well toward the front, much elevated above the hinge-line, prominent, incurved, approximate, and turned very slightly, if any, forward; hinge-margin moderately long for a species of this genus; front having a short, oblique truncation above, from the lower end of which the whole free margin of the shell is continuously rounded to the posterior extremity of the hinge, the convexity varying, but not very greatly, in different parts. Surface marked by very numerous fine costæ of nearly uniform size on all parts of the shell, every third one of which only bears upon its back many small nodes or short spines.

"Height from base to beak, 35^{mm}; width, 36^{mm}. The height is, however, sometimes greater than the width.

"This species bears more resemblance to *C. curtum* Meek & Hayden than to any other species of *Cardium* yet described from the Cretaceous

rocks of the West, but the prominent umbonal ridge, and the coarser and nonspiniferous costæ of that species, besides many other details, clearly separate it from the species here described; the peculiar character of the surface markings also separate it from any other described species with which it is in any danger of being confounded.

“*Position and locality.*—Cretaceous strata, probably equivalent with the lower portion of the Colorado group; head of Waterpocket canyon, southern Utah. Collected by Mr. G. K. Gilbert.”

CYRENIDÆ.

Genus CYRENA Lamarck.

CYRENA (VELORITINA) SECURIS Meek.

Pl. XXIII, Figs. 1-3.

Corbicula (*Cyrena*?) *securis* Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 494; White, 1879, idem for 1877, p. 289, Pl. 3, Fig. 2, *a*, *b*, *c*.

Cyrena (*Veloritina*) *erecta* White, 1876, Geol. Uinta Mts., p. 117.

Compare *Cyrena* (*Veloritina*) *durkeei* (Meek) White, 1876, U. S. Geog. and Geol. Surv. West 100th Meridian, vol. IV, p. 207, Pl. 21, Figs. 13*a*, *b*.

The original description was based on an internal cast. Near the same locality Dr. White obtained well preserved examples which he described as follows:

“Shell of medium size, obliquely subovate in marginal outline when adult, but subcircular when young, gibbous, especially the upper median portion, but somewhat laterally compressed at the postero-basal portion; antero-basal, basal, and postero-basal borders forming a continuous, almost regular, curve; the dorsal outline, by lateral view, also broadly rounded from the beaks to the postero-basal border; front a little concave transversely below the beaks, and also vertically concave from the beaks to a point a little below the midheight of the shell; beaks prominent, approximate, and curved forward; ligament short and narrow. This concavity of the dorsum resembles an escutcheon, except that it is not defined, especially at the ends; it is moderately deep, narrow, and bounded at the sides by the abrupt rounding inward and downward of the surface from the outer side of each valve, so that the hinge margin is wholly hidden from sight by a side view of the shell; hinge and interior unknown. Surface marked by the ordinary lines and imbrications of growth.

“Height, 33^{mm}; antero-posterior width the same; thickness about 22^{mm}.”

The additional specimen now before me, though slightly crushed just behind the beak, shows the larger part of the hinge. There are three rather small, slightly divergent cardinal teeth (in the left valve) of which the middle one is somewhat larger than the others. The lateral teeth are long and prominent, apparently not striate.

Both Prof. Meek and Dr. White have pointed out the close resemblance of this form to *Corbicula* (*Veloritina*) *durkeei*, a common species of the Bear River formation which underlies the beds containing *Cyrena securis*. Some individuals of the former have almost exactly the outline of this species, but they are usually larger and thicker shells and the hinge seems to be proportionally stronger and with more divergent teeth. I think, however, that they belong to the same genus. In southern Utah several forms of *Cyrena* are common near the base of the Colorado formation, where they are associated with *Glaucania coalvillensis*, *Barbatia micronema*, *Admetopsis*, etc. The specimen described by Dr. White as *Cyrena* (*Veloritina*) *durkeei* came from this horizon and might be referred with equal propriety to *C. securis*. Others associated with them approach the form of *Cyrena inflexa*, and still others differ from all those species, though I suspect that they all belong to one variable species. (See Pl. XXIII, Figs. 3 and 4.)

None of the species herein referred to *Cyrena* are typical examples of that genus. They all seem to belong to Meek's subgenus *Veloritina*, which he regarded as belonging to *Corbicula* and which combines some of the features of *Corbicula*, *Velorita*, and *Cyrena*, though, as it seems to me, somewhat more nearly related to *Cyrena* than to the other two genera.

Locality and position.—From the coal-bearing sandstones at Bear River city and near Hilliard station, Wyoming, probably near the top of the Colorado formation.

CYRENA ÆQUILATERALIS Meek?

Pl. XXII, Figs. 14 and 15.

Corbicula æquilateralis Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 495.

Original description:

"Shell (as determined from an internal cast) subtrigonal, and nearly or quite equilateral, rather convex; height about five-sixths the length; anterior and posterior extremities nearly equally, and rather narrowly rounded; ventral margin forming a nearly semielliptic curve, the most prominent part being at the middle; beaks rather prominent, and very nearly, if not quite, central; umbonal slopes not prominently rounded; dorsal outline declining subequally from the beaks in front and rear, the posterior slope being convex in outline, and the anterior concave; muscular impressions shallow. (Surface and hinge unknown.)

"Length, 1.72 inches; height, 1.45 inches; convexity, about 0.92 inch."

This species has never been figured and the type has not been preserved. Recent collections from the typical locality contain casts that agree well with the description and associated with them, one specimen retaining the shell, which is believed to belong to the same species. The beak is about half way between the middle and the anterior end,

but the cast of the same specimen would be much more nearly equilateral. The surface is smooth with obscure lines of growth. The details of the hinge are almost precisely the same as in the preceding species, excepting that the anterior lateral tooth is much smaller. In form the species is closely related to *C. inflexa* Meek.

Locality and position.—From the coal-bearing sandstones at Bear River city, Wyoming, probably near the top of the Colorado formation.

CYRENA INFLEXA Meek.

Pl. XXII, Fig. 13.

Corbicula (Veloritina) inflexa Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 493.

Cyrena inflexa White, 1879, idem for 1877, p. 290, Pl. 10, Figs. 7a and b.

Original description:

“Shell longitudinally ovate, a little less than two-thirds as high as long, moderately convex; posterior extremity rather narrowly rounded or apparently sometimes faintly subtruncated; anterior very short, subtruncated, or more or less sinuous in outline just in advance of the beaks on the abrupt forward slope above, and rather abruptly rounded below; basal margin semiovate or semielliptic; dorsal margins inflected and forming a long convex slope from the umbonal region posteriorly; beaks rather depressed, oblique, incurved, and placed near the anterior end; umbonal slopes not prominently rounded; surface merely showing fine, rather obscure marks of growth; anterior muscular impression rather strongly defined and obliquely ovate; posterior muscular impression larger and obscure; pallial line showing a deep, angular, ascending sinus; posterior lateral teeth of hinge very long, linear, and nearly or quite smooth; anterior short; cardinal teeth very oblique.

“Length of a specimen, a little under medium size, 1.35 inches; height, 0.39 inch; convexity, 0.68 inch.

“This species is more depressed and elongated than any of those hitherto described from the far western localities, excepting one or two from the coal formations on Bitter creek, Wyoming, from which it differs in having its beaks placed farther forward. It will also be readily distinguished from those shells, as well as from all of the other species of the genus yet known, from any of our rocks, by having an angular, ascending, and comparatively deep sinus in its pallial line, almost like that seen in many types of the Veneridæ. This character is so strongly marked that it was not until I had succeeded in getting a tolerably clear idea of the nature of the hinge that I could believe the shell related to the group to which I have referred it. As was pointed out by Mr. Tryon, some years back, the existing American species of *Cyrena* and *Corbicula* have the pallial line more or less sinuous; while in nearly all of those from foreign countries it is simple. I have also ascertained that nearly all the extinct North American species yet known

have the pallial line sinuous. The sinus, however, is usually shallow and rounded, or obtuse, in our fossil species; that of the shell here under consideration being unusually deep and angular.

“Locality and position.—Near Missouri river, below Gallatin city, Montana, where it occurs, associated with *Trigonia*, *Inoceramus*, *Cardium*, *Ostrea*, and other marine Cretaceous fossils.”

CYPRINIDÆ.

Genus VENIELLA Stoliczka.

VENIELLA MORTONI M. & H.

Pl. XXIII, Figs. 6–9.

Venilia mortoni Meek and Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 27.

Veniella mortoni Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 154, Pl. 4, Figs. 3a, b.

Revised description:

“Shell transversely oblong, or subtrapezoidal in outline, gibbous, thick, and strong; base nearly straight, but rounding up in front; dorsal margin parallel to the base, excepting where it declines, at first gently, then abruptly, into the obliquely-truncated posterior; anterior side truncated vertically immediately in front of the beaks, just below which there is a slight sinuosity of outline, as seen in a side view; posterior basal extremity narrowly rounded, or subangular; beaks very oblique, strongly incurved, gibbous, and placed directly over the anterior; umbonal slopes forming a prominent, rather angular, oblique ridge, from each beak to the posterior basal extremity; lunule and escutcheon impressed, but without strongly defined margins; surface marked with distinct concentric striæ, and stronger, irregular ridges, the latter of which sometimes pass into regular, rather distant, low varices on the umbones.

“Length, 1.66 inches; height, 1.40 inches; convexity, 1.17 inches.

“This species is nearly related, at least in external characters, to *V. Conradi* Morton, but differs in being more oblique and more depressed at the beaks, which are also placed directly over the more truncated anterior margin. Its dorsal margin is also longer and less sloping than in Morton’s species. It will be more readily distinguished from the last by its greater proportional length, less angular umbonal slopes, and rougher surface.

“I have not seen the hinge of this species; but from its form and general external appearance, there is little reason for doubting that it belongs to the genus under which it is placed.

“Locality and position.—Chippewa point, on the upper Missouri, near Fort Benton; from the Fort Benton group of the Cretaceous.”

The specimens that are figured on Pl. XXIII came from the upper part of the Fort Benton shales on the Arkansas river, 20 miles west of

Pueblo, Colorado. They differ from the type in that the beaks are not quite so near the anterior end and the posterior end is more narrowly rounded, but these differences are not regarded of specific importance. This species may also be compared with *Veniella humilis* M. & H., which is found at the top of the Montana formation.

The hinge (of the left valve) is very much like that of *V. conradi*, the type of the genus there being three strong, thick cardinal teeth and a long posterior lateral tooth.

VENIELLA GONIOPHORA Meek.

Pl. XXIII, Fig. 5.

Veniella goniophora Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 152, Fig. 12 in text, and Pl. 4, Fig. 4.

“Shell rather thin, short, subquadrate or subtrapezoidal, with length only slightly greater than the height, becoming extremely gibbous with age, the convexity of large specimens sometimes equaling the length; dorsal outline more or less straightened, or, in large adult specimens, curving downward somewhat posteriorly to the rather short, truncated, posterior margin; basal margin generally rather deeply rounded in outline anteriorly, and straightened or even slightly sinuous and ascending posteriorly, to the posterior basal extremity, which is distinctly angular; anterior side narrowly rounded below, and deeply sinuous under the beaks above; beaks prominent, very gibbous, obliquely and strongly incurved, in young shells located near the anterior side, though not quite as prominent as the margin below, but in the adult sometimes overhanging the anterior margin; lunule excavated, but apparently not defined by a marginal ridge; posterior umbonal ridge very prominent and strongly angular from the beaks to the posterior basal angle, while the space between it and the dorsal margin is concave; surface showing concentric striæ, and generally a few stronger ridges.

“Length of the largest specimen seen, 1.60 inches; height of same, 1.38 inches; convexity, 1.55 inches.

“Casts of this species show the posterior lateral teeth of the hinge to present the usual characters of the genus; while in one specimen the posterior cardinal tooth of the right valve can be seen to be strong and deeply bifid. Another specimen shows the middle cardinal tooth of the left valve to be strong, prominent, broadly trigonoid conical, and slightly curved upward at the end, as in the type-species, and the posterior cardinal to be narrow and arcuate; the oblique, trigonal pit for the middle cardinal tooth of the other valve occupying the space between the two. None of the specimens show the anterior cardinal tooth of either valve; but enough of the hinge and other characters can be determined to remove all doubt in regard to its being a true typical *Veniella* and not a *Venilicardia*.

“Generally, the internal casts of this species retain no traces of the

surface-markings, but sometimes they present faint remains of concentric undulations. The posterior umbonal ridges, however, are always strongly defined, and angular even on internal casts. Some large specimens have, in casts, a strong, obtuse ridge near the dorsal margin of each valve, apparently bounding a kind of broad lanceolate escutcheon, the middle and deeper part of which is occupied by the rather narrow ligament.

“Young specimens of this shell present much the general outline of small individuals of *Veniella* (*Venilicardia obtruncata*) Stoliczka, (Palæont. Ind., III, Pl. VIII, Figs. 7 and 7a, b); but they have the umbonal ridge of each valve much more deeply defined, while the hinge characters of the two shells are altogether different. Of course, if Dr. Morton's name *Venilia* should be retained for this genus, the name of this species would become *Venilia goniophora*.

“*Locality and position.*—Missouri river, near Fort Benton; Fort Benton group of the Cretaceous.”

Dr. White reports the species from “southeast of Paria, Utah.”¹

There is some reason for doubting that this is really distinct from *Veniella mortoni*.

VENERIDÆ.

Genus TAPES Megerle v. Mühlfeldt.

TAPES CYRIMERIFORMIS n. sp.

Pl. XXIV, Figs. 1-6.

Shell of medium size, equivalve, moderately convex, subcircular in outline; beaks small, approximate, situated a little in advance of the middle; cardinal margin sloping with nearly equal gentle convexity in both directions from the beaks; anterior end broadly and regularly rounded; posterior end slightly subangular above and rounded below; basal margin forming a regular gentle curve. Surface marked by fine lines of growth. There is no distinctly defined lunule. The ligament, which is preserved on some specimens, is relatively large and prominent.

Hinge of right valve with three strong, divergent, cardinal teeth, of which the posterior is deeply bifid and the other two are smaller and more approximate. In the left valve, which also has three teeth, the anterior tooth is very small, the middle one is larger and slightly bifid, and the posterior one is very long and oblique and situated near the outer margin of the hinge.

The muscular scars are large, ovate, not very strongly marked; palial sinus deep, ascending and narrowly rounded at the extremity.

One of the type specimens measures 49^{mm} in length, 42^{mm} in height, and 16^{mm} in convexity of both valves united. The corresponding meas-

¹ See U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 185.

urements of another specimen, that is much more convex than any of the others, are: Length, 44^{mm}; height, 36^{mm}; convexity, 18^{mm}. Other examples are somewhat larger than either of these.

This species would probably be included in *Cyprimeria* as extended and defined by Zittel in the Handbuch der Palæontologie, but it differs from the typical species of that genus in that it is equivalve, its valves are not twisted, and its pallial sinus is deep. The hinge resembles that of *Cyprimeria* in a general way, especially if the two anterior teeth of the right valve be regarded as one bifid tooth. *Venus faba* Sow., which is apparently a closely related form showing precisely the same generic characters, has been referred by some authors to *Cyprimeria*, but Holzapfel¹ has recently regarded it as a *Tapes*, and after comparing the Colorado fossils with recent species of that genus the reference seems to me a natural one.

Locality and position.—In the Pugnellus sandstone on Williams creek, Muddy creek, and Poison canyon, Huerfano park, Colorado. Casts that are believed to belong to this species have been found in the "first ridge" at Coalville, Utah.

Genus LEGUMEN Conrad.

This genus was described in 1858² and the description was supplemented in 1860³ after the hinge of both valves had been studied. The type is *Legumen ellipticum*, from the cretaceous beds near Ripley, Mississippi.

It has always referred to the Solenidæ, but in form and in the details of the hinge it agrees very closely with *Tapes fragilis* (d'Orb.), and I believe that it is congeneric with that species which is the type of Stoliczka's genus *Baroda*. If this proves to be true *Baroda*, being a later name, should be treated as a synonym.

In Tryon's Structural and Systematic Conchology, vol. III, p. 132, this genus is erroneously called *Legumenaia* Conrad.

LEGUMEN, sp.

Pl. XXIV, Fig. 11.

In the Pugnellus sandstone in Poison canyon, Colorado, a single specimen was found that probably belongs to this genus. It is a cast of a left valve retaining a little of the shell near the dorsal margin, but it does not show the structure of the hinge nor the pallial line.

In outline it is not very different from *Baroda wyomingensis* Meek, from the upper portion of the Montana formation, and it is still more nearly like the forms from the Ripley beds on which Conrad founded his genus *Legumen*.

¹Die Mollusken d. Aachener Kreide, II. Abtheil., p. 165, Pl. 13, Figs. 7-10, Palæontographica, vol. 35.

²Jour. Acad. Nat. Sci. Phila., 2d ser., vol. III, p. 325.

³Idem, vol. IV, p. 277.

Genus CALLISTA Poli.

CALLISTA (DOSINIOPSIS?) ORBICULATA H. & M.

PL. XXIV, Figs. 9 and 10.

Cytherea orbiculata Hall and Meek, 1856, Mem. Am. Acad. Arts and Sci. n. s., vol v, p. 382, Pl. 1, Fig. 7.

Meretrix orbiculata Meek and Hayden, 1860, Proc. Acad. Nat. Sci. Phila., p. 185.

Dione orbiculata Meek, 1864, Smithsonian Check List Invert. Foss. of N. A., p. 13.

Callista (Dosiniopsis) orbiculata Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 186, Pl. 5, Figs. 2 a-c.

Revised description:

"Shell thick, suborbicular; beak moderately elevated and near the anterior side; posterior margin regularly rounded; surface marked by fine, equal, concentric lines.

"Length, 1.08 inches; height, 1 inch; width, 0.66 inch.

"Our specimens of this species are merely internal casts, with portions of the shell attached. Like that first figured by Prof. Hall and the writer, they present no characters by which we can determine definitely its generic relations. Some of the specimens show the muscular impressions to be shallow and ovate in form; the posterior impression being, as usual, broader than the anterior. The pallial line is provided with a triangular sinus, which extends a little obliquely upward and forward, about two-thirds of the distance from its base toward the middle of the valves, its sides converging at an angle of about 125° to 130° .

"Although some of our specimens present exactly the form of the figure above cited, the majority of them differ considerably, being more nearly transversely-ovate in outline, in consequence of the posterior side being more extended and less broadly rounded. These may belong to a different species; but as they vary in this respect, and their muscular and pallial impressions, as well as the thickness of the shell, are exactly as in the more orbicular individuals, I do not think it advisable to separate them without being satisfied, from the comparison of better specimens, that they are distinct.

"Should these more nearly ovate specimens be identical with *C. orbiculata*, as believed, the specimen first figured in the memoirs of the American Academy of Arts and Sciences must give an incorrect idea of the general form of this species, since a majority of the specimens are much less broadly rounded posteriorly.

"Some varieties of this species, especially the broader forms, resemble somewhat the species *C. Owenana*, but they are usually less concave in outline just in advance of the beaks, and the pallial sinus is always different in form, as may be seen by the figures. Some of the varieties also resemble our *C. Deweyi* in form, as well as in the pallial sinus and muscular impressions, but it is evidently a much thicker shell, and often distinctly more gibbous.

“*Locality and position.*—Five miles below the mouth of James river, at the base of the Fort Benton group, or formation No. 2 of the Upper Missouri Cretaceous. It was from this same locality and position that the specimen first figured by Prof. Hall and the writer was obtained.”

CALLISTA (APHRODINA?) TENUIS H. & M.

Pl. XXIV, Figs. 7 and 8.

Cytherea tenuis Hall and Meek, 1856, Mem. Am. Acad. Arts and Sci., n. s., vol. v, p. 383, Pl. 1, Fig. 5.

Meretrix tenuis Meek and Hayden, 1860, Proc. Acad. Nat. Sci., Phila., p. 185.

Dione ? tenuis Meek, 1864, Smithsonian Check-List, Invert. Foss. of N. A., p. 13.

Callista (Aphrodina ?) tenuis Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 188, Pl. 5, Figs. 1, a-d.

Revised description:

“Shell thin, varying in form from subcircular to transversely ovate, rather gibbous at maturity. Anterior side rather short, obliquely subtruncate above, and abruptly rounded below; base forming a semi-ovate curve, being a little more prominent before than behind the middle; posterior side narrowly rounded, or subtruncate; beaks moderately prominent, somewhat gibbous in old shells, incurved, contiguous, and placed nearly halfway between the middle and anterior side; lunule obovate, flat, and not very distinctly defined. Surface marked by fine, crowded, concentric striae, and sometimes a few, obscure, parallel furrows near the border.

“Length of an adult shell (oval var.), 1 inch; height, 0.78 inch; convexity, 0.56 inch.

“None of our specimens expose the interior, but internal casts show that the muscular impressions are faintly marked and of a rather narrow ovate form, both before and behind. The pallial line is also seen to be provided with a broad, shallow sinus, having nearly the form of an equilateral triangle. Little or nothing being known in regard to the teeth of its hinge, it is, like the last, only referred doubtfully to this group. By working carefully about the hinge, however, and grinding down some of the specimens, I have nearly satisfied myself that it has a small anterior lateral tooth as in *Meretrix* (= *Cytherea*) and *Callista*; and as the pallial sinus is distinctly triangular, as in some sections of the latter, I think there is not very much reason for doubting the propriety of placing it, at least provisionally, in the latter genus; though better specimens may show it to belong to some other group.

“*Locality and position.*—South fork of Cheyenne river, near the base of the Black hills, in the Fort Union [Benton] group, or formation No. 2 of the Upper Missouri Cretaceous. The specimens first described in the paper cited at the head of this description were collected from the same formation on the Missouri river, 5 miles below the mouth of James river.

DONACIDÆ.

Genus DONAX Linnæus.

DONAX CUNEATA n. sp.

Pl. XXV, Fig. 1.

Shell transversely elongate-triangular, moderately thick, somewhat compressed, especially toward the front; anterior end very greatly produced, narrowly rounded at the extremity and slightly curved upward, the dorsal margin being gently concave and the base somewhat convex in outline; posterior end abruptly truncate about at right angles to the longer axis of the shell; the truncate portion bordered by the sharp prominent vertical umbonal ridge extending from the beak to the postero-basal angle; beak rather prominent, directed slightly forward, nearly or quite terminal (at the posterior end).

Surface apparently smooth and the free margins not crenate within.

The hinge has not been exposed sufficiently for figuring, but its structure can be seen fairly well in the type, which is a right valve. There are two approximate cardinal teeth under the beak, and both the anterior and posterior lateral teeth are well developed, the former being elongate and located a considerable distance in front of the beak, while the latter is shorter and is near the cardinal teeth.

Length, 27^{mm}; height at posterior end, 16^{mm}; convexity of single valve at posterior end, 45^{mm}.

The type of this species is a right valve from which most of the shell has been eroded. A smaller sandstone cast from another locality and a higher horizon has the same outline and probably belongs to the same species. With such limited and imperfect material it is of course impossible to say positively whether the generic reference above given is correct, but the form and the internal features, so far as they are known, agree very well with some living species of *Donax*. If it really is a *Donax* it is one of the oldest known species. The oldest previously described American form that has been referred to the genus is *D. lata* Gabb, from the Tejon group of California. Stoliczka figures a specimen which he says seems to be a true *Donax* from the upper part of the Cretaceous of southern India. The same author states that other described Cretaceous species probably do not belong to this genus.

I do not know any fossil form hitherto described with which this species need be compared.

From the species described below it differs in that its anterior end is proportionally longer, more slender, and more narrowly rounded in front, while its posterior end is much shorter.

Locality and position.—The type is from coal-bearing sandstone at Bear River city, Wyoming, where it is associated with *Inoceramus labiatus*, *Pugnellus fusiformis*, *Cardium pauperculum*, etc. The other

specimen above mentioned is from the "third ridge" of the section at Coalville, Utah, which is a considerably higher horizon and probably in the Montana formation.

DONAX? OBLONGA n. sp.

Pl. xxv, Fig. 2.

Shell rather large, moderately convex, transversely oblong, with the short posterior end obliquely truncate; dorsal and ventral margins nearly parallel; anterior end produced, broadly rounded at the extremity with the greatest convexity of the curve above; posterior umbonal slope prominent and angular, varying considerably in obliquity, but always more oblique than in *D. cuneata*; beak rather prominent, incurved. Surface and hinge unknown. The casts show a few distant concentric furrows.

Length of the largest specimen, 45^{mm}; height, 28^{mm}; greatest convexity of single valve, 8^{mm}.

Besides the large specimen that is figured there are six other much smaller ones that were found associated with it and doubtless belong to the same species. They are all internal casts in sandstone, showing none of the generic features excepting the form, but they are apparently related to the preceding species, and are therefore referred to the same genus.

I dislike to describe and name such obscure fossils, but in the present case, as the form is very different from any of its associates, it can be easily identified if better preserved examples are ever found, and meanwhile the species is just as useful for geological purposes as it would be if all its characteristics were known.

Locality and position.—In the "second ridge" of the Cretaceous section at Coalville, Utah, which is approximately the same horizon from which the preceding species were obtained.

TELLINIDÆ.

Genus TELLINA Linnæus.

TELLINA MODESTA Meek.

Pl. xxv, Fig. 3.

Tellina modesta Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, p. 157, Pl. 15, Figs. 4 and 5.

Original description:

"Shell rather small, transversely elongate-subelliptic, being twice as long as high, rather distinctly compressed; anterior margin narrowly rounded; base forming a long, semielliptic curve; posterior extremity more narrowly and less regularly rounded than the other, apparently slightly bent to the left; dorsal margin declining very slightly, with

convex slopes, both in front and behind the beaks; beaks very nearly central and inconspicuous, being depressed and compressed. Surface of casts smooth, but probably on well-preserved shells marked with fine concentric striae. Hinge and interior unknown, with the exception of some appearances of lateral teeth seen in casts.

“Length, 0.86 inch; height, 0.44 inch; convexity, 0.10 inch.”

The name of this species was first used in a list of fossils from Coalville, Utah, published in the Ann. Rept. U. S. Geol. Sur. Terr. for 1872, but it was not then described. All the specimens yet found are casts in sandstone that show neither the natural surface nor the internal features. It does not resemble any known form in the Cretaceous of the interior region, but there is a closely related undescribed species in the Ripley beds of Texas, and when describing it Prof. Meek pointed out its resemblance to *T. ashburneri* which occurs in the Chico series of California.

Locality and position.—Whitish Cretaceous sandstone on East Canyon creek, Wasatch range, Utah. The specimen figured is from the “second ridge,” at Coalville, Utah.

TELLINA (PALÆOMÆRA?) WHITEI n. sp.

Pl. XXV, Figs. 4-7.

Shell of medium size, inequilateral, subovate, moderately convex; beaks rather broad and flat, situated behind the middle and directed backward; posterior end descending abruptly from the beak in a broad somewhat irregular curve to the base, where it is obscurely subangular; cardinal margin in front of the beaks, straight, descending with a more gentle declivity to the anterior end, which is regularly rounded and slightly narrower than the posterior end; base nearly straight in the middle, more strongly curved toward the ends. Surface marked by fine concentric striae and lines of growth. An obscure ridge extends from the umbonal region near the margin of the valve to the postero-basal angle, and a short distance in front of it the shell is slightly bent to the right. One of the specimens shows traces of a few faint impressed radiating lines near the posterior end.

The ligament is rather prominent and there is a deep lanceolate area in front of the beaks. The pallial sinus is broad and deep.

Length of the larger type specimen, 35^{mm}; height, 25^{mm}; convexity of both valves united, 12^{mm}.

As neither of the two types shows the hinge the generic relations of this species are doubtful, but the features above described are deemed sufficient to warrant its assignment to the Tellinidæ, and on account of its general resemblance to *Tellina (Palæomæra) inconspicua* Forbes as figured by Stoliczka¹ it is provisionally placed in the same subgenus.

Locality and position.—In the Pugnellus sandstone on Williams creek, Huerfano park, Colorado.

¹ Cret. Pelec. of S. India, pl. 4, figs. 6-8.

TELLINA? SUBALATA Meek (sp.).

Pl. XXV, Fig. 9.

Cyprimera subalata Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 476.*Cyprimeria? subalata* Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. IV, Pt. 1, p. 158, Pl. 15, Fig. 7.

Revised description:

"Shell transversely broad-subovate or subelliptic, strongly compressed; extremities rather narrowly and nearly equally rounded; basal margin forming a regular semielliptic curve, being most prominent along the middle, and rounding up gradually and equally into the anterior and posterior lateral margins; dorsal margin sloping from the beaks, the posterior slope being more convex in outline than the anterior; beaks small, scarcely projecting above the hinge-margin, very nearly or exactly central, and almost entirely without obliquity. Surface apparently smooth, or only showing very fine, obscure, concentric striæ. (Hinge and interior unknown.)

"Length, 1.22 inches; height, 0.90 inch; convexity of left valve, only about 0.12 inch."

The type specimen bears the label *Tellina* (*Arcop.*) *subalata* in Mr. Meek's handwriting, but after comparing it with *Cyprimeria depressa* Conrad he concluded that it belonged to the same genus on account of a resemblance in form. The additional material recently collected at Coalville, Utah, is in the form of casts, one of which retains impressions of two cardinal teeth, showing that it belongs to the Tellinidæ rather than the Veneridæ.

Locality and position.—The type is from whitish Cretaceous sandstone, East Canyon creek, Wasatch range, Utah, where it is associated with *Trigonarca obliqua* and other Colorado species. At Coalville it was found in the sandstone of the "third ridge," which is believed to belong to the Montana formation.

TELLINA?? ISONEMA Meek.

Pl. XXV, Fig. 8.

Tellina?? isonema Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. IV, pt. 1, p. 156, Pl. 15, Fig. 6.

Original description:

"Shell transverse, elliptic-subtrigonal in outline, compressed, and nearly or quite equilateral; anterior margin narrowly rounded; base forming a semi-elliptic curve; posterior end narrowly rounded or subangular at the termination of a slight, oblique flexure of the valves; dorsal margin sloping from the beaks to the extremities, with a moderately convex outline; beaks almost central, rather small, and projecting a little above the cardinal margin, incurved with scarcely any visible obliquity; hinge and interior unknown. Surface ornamented by

fine, perfectly regular, concentric, thread-like lines, gradually becoming smaller and more crowded toward the umbones, on which they are nearly or quite obsolete.

"Length, 0.90 inch; height, 0.60 inch; convexity, about 0.20 inch."

Prof. Meek explains that the species is known only in the form of sandstone casts that do not show the hinge nor any other internal characters and that its reference to *Tellina* is very doubtful. It seems to me more probable that it is a *Mactra*, but as I have not been able to demonstrate the character of the hinge it is left under the original name.

Locality and position.—East Canyon creek, Wasatch range, Utah; sandstone of the "second ridge" at Coalville, Utah. A cast that seems to belong to this species was found in the "third ridge" of the same section.

SOLENIIDÆ.

Genus SILIQUA Megerle v. Mühlfeldt.

SILIQUA HUERFANENSIS n. sp.

Pl. XXV, Figs. 10 and 11.

Shell long and narrow, inequilateral, somewhat compressed, gaping at both ends; dorsal margin very slightly convex; basal margin nearly straight or slightly sinuous in the middle; both ends broadly rounded, but the anterior end slightly narrower than the posterior; beaks very small and inconspicuous, located a little in advance of the middle. Substance of the shell thin, marked on the surface by very faint lines of growth and by a few larger irregularly arranged concentric undulations.

Pallial sinus broad, rounded and rather deep. Muscular impressions near the cardinal margin, well marked on adult shells; the anterior one elongate and narrow, just in front of the beak; posterior impression ovate, about half way between the beak and the posterior end. An internal rib runs obliquely downward and forward from the beak, gradually becoming less prominent and ending about half way between the dorsal and ventral margins. The structure of the hinge has not been satisfactorily made out, but some of the casts show impressions of two or three very small cardinal teeth.

Length of medium-sized specimen, 58^{mm}; greatest height, 18^{mm}; convexity of the two valves united, about 9^{mm}.

In outline this shell is very similar to some recent species of *Pharella*, but the presence of the internal rib and the large size of the pallial sinus will not allow a reference to that genus, and on account of these features it is provisionally referred to *Siliqua*. I think that *Pharella ? dakotensis* M. & H., from the Dakota formation near the mouth of Big

Sioux river, is closely related to this species, though probably distinct.

Locality and position.—In the Pugnellus sandstone on Williams creek and other places in Huerfano park, Colorado, where about forty specimens were collected, and near the base of the cretaceous section at Coalville, Utah.

Genus PHARELLA Gray.

PHARELLA? PEALEI Meek.

Pl. XXV, Figs. 12 and 13.

Pharella? pealei Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 496;—White, 1880, *idem* for 1878, p. 21, Pl. 11, Figs. 6a, b.

Original description:

“Shell elongate-oblong, or subrhombic, the length being about twice and a half the height, rather compressed; anterior margin slightly sinuous just in advance of the beaks above, and somewhat narrowly rounded below this faint sinuosity; posterior margin truncated, with a convex outline, very obliquely backward and downward, from the posterior extremity of the hinge to the prominent and very narrowly rounded or angular posterior basal extremity; hinge-line proper apparently comparatively short, and not forming any angularity of outline at its connection with the sloping posterior dorsal margin; beaks rising a little above the hinge margin, but rather depressed and placed about one-fifth the entire length of the valves from the anterior margin; basal margin long, slightly sinuous along most of its length; posterior dorsal slopes rather prominently rounded from the beaks obliquely to the posterior basal extremity. Surface only showing obscure lines of growth.

“Length, 1.20 inches; height, 0.48 inch; convexity, 0.28 inch.

“Knowing nothing of the hinge of this shell, I only refer it provisionally to *Pharella*. It does not seem to have had the extremities gaping as in that genus; but the specimen has evidently been accidentally compressed, and this may have given the valves the appearance of being closed. In general appearance it resembles *Solen guerangeri* d'Orbigny, which seems to belong to the genus *Pharella*. Our shell, however, evidently differs from d'Orbigny's specifically, at least, in not having the posterior margins of its valves near so abruptly truncated, but rounding and sloping forward gradually into the dorsal outline above. Possibly I should call it *Modiola pealei*.

“*Locality and position.*—Missouri river, below Gallatin, Montana. Cretaceous.”

PHOLADOMYIDÆ.

Genus PHOLADOMYA Sowerby.

PHOLADOMYA PAPYRACEA M. & H.

Pl. XXVI, Fig. 1.

Pholadomya papyracea Meek and Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 27;
Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 217, Pl. 5, Figs. 4a and b.

Revised description:

"Shell under medium size, very thin and fragile, transversely sub-ovate in outline, with length about once and a half the height, rather compressed, the greatest convexity being in the anterior and umbonal regions; posteriorly cuneate and a little gaping; outline of base regularly semiovate, its greatest prominence being a little in advance of the middle; anterior side short and rounded; posterior longer and more narrowly rounded; hinge margin straight, not inflected so as to form a defined false area, but subcarinate all along; beaks depressed, small, and incurved, located near the anterior end of the valves, though not terminal. Surface of each valve ornamented by about ten to twelve small radiating costæ, which are crossed, and, as it were, cut into very small tubercles by numerous, very regular, sharply defined, and much more closely arranged concentric ribs and furrows, the markings being all well defined on the internal cast.

"Length about 1.16 inches; height, 0.76 inch; convexity, 0.55 inch.

"In a side view this species more nearly resembles *P. tenera* of Agassiz (particularly as illustrated by Fig. 16, Pl. 3a, of his Étud. Crit.) than any other form with which I have compared it. It is decidedly more compressed, however, as well as more depressed, and may also be at once distinguished from that species by having no traces of a false cardinal area, which is well defined in that species. The only good specimen of it that I have seen was found by Lieut. Mullan of the United States Topographical Engineers.

"*Locality and position.*—Chippewa point, near Fort Benton, on the upper Missouri, in the Fort Benton group of the Cretaceous series of the Northwest."

Some specimens recently collected from the same horizon in northern Montana by Mr. W. H. Weed are fully twice as large as the type.

PHOLADOMYA COLORADOENSIS n. sp.

Pl. XXVI, Fig. 2.

Shell transversely elongate oval, depressed; anterior end regularly rounded from the beak to the base; basal margin forming an irregular broadly rounded curve with the greatest convexity in the posterior third; posterior end abruptly narrowed and subangular; beaks rather

broad, approximate, projecting considerably beyond the hinge line and situated about one-fifth the total length of the shell behind the anterior end. Surface marked by 25 to 28 narrow, angular, radiating costæ, some of which occasionally bifurcate. The interspaces are not quite equal, even on the middle portions of the valve, and they become much broader toward the anterior and posterior ends.

Length, 46^{mm}; height, 29^{mm}; convexity of a single valve, about 10^{mm}. Broken specimens in the collection show that the species sometimes reached dimensions one-half greater than those given.

This species seems to be closely related to *P. breweri* Gabb, from the Cretaceous of California, and it is also quite similar to *P. subventricosa* M. & H., from the Fox Hills beds at the mouth of Judith river. From the former it differs in the more elongate form, more contracted posterior end, and less regular costæ.

Pholadomya subventricosa is known only by a single distorted specimen, but it seems to be more ventricose, and the posterior end is broader and the beaks are nearer the anterior end than in our species.

Locality and position.—Williams creek, Huerfano county, Colorado, in the Pugnellus sandstone.

ANATINIDÆ.

Genus ANATINA Lamarck.

ANATINA LINEATA n. sp.

Pl. XXVI, Figs. 3 and 4.

Shell of medium size, transversely subelliptical or elongate ovate in outline, inequilateral; anterior end produced, broadly and regularly rounded; posterior end short, gaping, abruptly contracted, and more narrowly rounded; dorsal margin concave immediately behind the beaks and gently convex in front; basal margin forming a broad curve; beaks small, approximate, fissured, with an oblique internal rib behind the fissure. The valves are slightly flattened in the middle, so that the greatest convexity is in advance of that region. Surface marked by strong concentric undulations that become obsolete on the posterior third of the shell, and by more numerous fine concentric lines covering the whole valve. The best preserved impression of the surface shows also two to three faint radiating lines on the umbonal region.

Length of a large specimen (anterior portion restored from other examples), about 70^{mm}; height, 44^{mm}; convexity of both valves united 16^{mm}.

Anatina sulcatina Shumard? as figured by Whiteaves¹ and by White², is very closely related to the form here described. Our species has somewhat more prominent beaks and it lacks the well-defined furrow that extends from the beak to the base in *A. sulcatina*.

¹ Mesozoic Fossils, vol. I, Pl. 17, Fig. 5.

² Bull. U. S. Geol. Sur. No. 51, Pl. 6, Fig. 1.

Locality and position.—In the Pugnellus sandstone on Williams creek and in Poison canyon, Huerfano county, Colorado. At Coalville, Utah, casts that are believed to belong to the same species were found in the sandstone of the “first ridge,” and also at a much higher horizon in the “third ridge” of the same section.

Genus LIOPISTHA Meek.

LIOPISTHA (PSILOMYA) MEEKI White.

Pl. XXVI, Figs. 5–7.

Liopistha (Psilomya) Meeki White, 1874, Expl. and Sur. West 100th Merid., Prelim. Rept. Invert. Fossils, p. 26; 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 186, Pl. 18, Fig. 14a–d.

Revised description:

“Shell short, much inflated; umbones large, elevated; beaks small, strongly curved inward and downward, and very slightly turned forward; posterior portion moderately produced, somewhat compressed laterally; free margins forming a regular but unequally convex curve, the greatest convexity of which is in front and the least along the base; upper portion of the posterior border obliquely truncated, so that the greatest posterior extension of the shell is a little below the hinge extremity.

“Surface having a smooth aspect, but it is marked by fine concentric lines of growth. Under a lens, very fine, obscure, radiating striæ are seen upon the surface of a little more than the anterior half of the shell; and upon the remainder of the surface, except a small space adjoining the posterior cardinal border, there are small, somewhat distant, radiating striæ, easily seen by the unassisted eye. Upon these striæ, both the distinct and the obscure, the lens shows numerous minute punctures, placed at irregular intervals, which are the bases of minute, short, blunt spines, or which mark the places from which the spines have been removed.

“Length, 25^{mm}; height, from base to umbo, 20^{mm}; greatest thickness, both valves together, 16^{mm}.

“This shell seems to be more nearly related to *L. globulosa* (= *Poromya globulosa* Forbes) than to any other described species. Compared with that species, as figured and described by Stoliczka,¹ ours differs in being less globular, in having the umbones more elevated, and in the more distinct radiating striæ upon the posterior half of each valve.”

Locality and position.—The types come from southeast of Paria, Utah. In the Upper Kanab valley, which is not far from the typical locality, it occurs about 350 feet above the base of the Cretaceous section, associated with characteristic species of the Colorado formation.

¹ Cretaceous Fauna of Southern India, vol. III, p. 47, Pl. III, Fig. 8, and Pl. XVI, Fig. 16.

LIOPISTHA (PSILOMYA) CONCENTRICA n. sp.

Pl. XXVI, Figs. 8-10.

Shell of medium size, very thin, transversely ovate in outline, moderately convex; anterior and basal margins forming a continuous but unequally convex curve; posterior end subangular and compressed; dorsal margin behind the beak, straight, slightly descending, abruptly deflected so as to form a distinct false area which bears fine transverse striæ and is separated from the body of the shell by a narrow furrow running from the beak to the angular posterior end; beaks prominent, ventricose, incurved, and but slightly oblique, situated a little in advance of the middle. Surface marked by lines of growth and regular concentric undulations that are about 1^{mm} apart on the body of the shell, but are more closely arranged and more prominent near the beaks.

Length of one of the largest specimens, 27^{mm}; height, 19^{mm}; convexity of a single valve, 8^{mm}.

This species has very nearly the size and shape of *L. meeki*. It is slightly more elongate, however, and its surface ornamentation is entirely different. The Survey collections contain more than a dozen of each of these species, and the differences seem to be constant. The Utah species, *L. meeki*, never has the concentric undulations, and always shows more or less radiating striæ, while in *L. concentrica* the reverse of this is true.

Locality and position.—In the Pugnellus sandstone on Williams creek and in Poison canyon, Huerfano park, Colorado, and at about the same horizon on the Arkansas river, 20 miles above Pueblo, Colo.

NOTE.—Since the above description was written about 25 additional specimens of *Liopistha meeki* have been collected in southern Utah, and among them is one marked with distinct radiating striæ and with concentric undulations almost as strong as in *L. concentrica*. Possibly the latter should be regarded as only an extreme variety of *L. meeki*, though the two forms are easily distinguishable.

LIOPISTHA (PSILOMYA) ELONGATA n. sp.

Pl. XXVI, Figs. 11 and 12.

Shell rather large for this genus, inequilateral, transversely elongate, moderately convex in the umbonal region, and compressed posteriorly; dorsal margin behind the beak, straight, and inflected so as to form a narrow false area; anterior margin forming a regular curve from the beak to the ventral margin, which is but slightly curved and almost parallel with the dorsal margin; posterior end subtruncate above and narrowly rounded into the base below; beaks prominent, ventricose, incurved, and approximate, situated about half-way between the middle and the anterior end. Surface marked by lines of growth and obscure concentric undulations that are most prominent on the umbonal region, and are as distinct on the casts as on the surface.

Length, 37^{mm}; height, 27^{mm}; convexity of a single valve, 9^{mm}.

Externally this species has a close resemblance to certain forms of *Pleuromya*, and I was inclined to refer it to that genus, although it is not reported as occurring in beds later than the Lower Cretaceous. On further examination a part of the hinge of a left valve was exposed, revealing a prominent conical tooth under the beak. So far as it is known, therefore, the hinge is like that of *Liopistha*. The surface is not well enough preserved to show whether it was marked by the obscure radiating lines of granules or minute spines that usually appear on species of the *Psilomya* section of this genus, but this feature seems to be wanting in *Liopistha* (*Panopæa*) *frequens* Zittel, a species from the Gosau beds that is very closely related to ours. Another species, described above under the name *Liopistha* (*Psilomya*) *concentrica*, has very nearly the same surface ornamentation as *L. elongata*, but its form is more nearly like that of the typical species of the genus. It is worthy of remark that the three species herein described are the only American ones that have been referred to the subgenus *Psilomya*, and they all come from approximately the same horizon.

Locality and position.—Upper Kanab valley, Utah, from concretions in shale about 350 feet above the base of the Cretaceous section.

MACTRIDÆ.

Genus MACTRA Linnæus.

MACTRA (CYMBOPHORA?) UTAHENSIS Meek.

Plate XXVII, Figs. 16 and 17.

Mactra (*Cymbophora*) *utahensis* Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, Pt. 1, p. 155, Pl. 15, Figs. 9, 9a, 9b.

“Shell subovate, moderately convex; anterior margin rounded; posterior margin narrower, and rather abruptly rounded, or sometimes apparently slightly truncated, being most prominent below; basal margin forming a semielliptic or semiovate curve, being sometimes more prominent anteriorly; dorsal outline sloping from the beaks toward the extremities; beaks moderately prominent, very nearly central, and incurved with little obliquity; umbonal slopes merely rounded, and not terminating in a flexure of the posterior basal margin. Surface apparently merely marked with fine, obscure, irregular lines of growth. Hinge merely known to possess linear anterior and posterior lateral teeth. Ligament and internal characters unknown.

“Length, 1.35 inches; height, 0.90 inch; convexity, about 0.50 inch.

“The specimens of this shell in the collection agree so nearly with a form described by the writer in connection with Dr. Hayden, from the Upper Cretaceous beds on Deer Creek, near the North Platte, under the name *Tellina nitidula*, that I was at one time inclined to think they might belong to a variety of that species. Still, as they are merely casts, giving but a limited knowledge of the hinge, and showing nothing

of the internal characters, it is much more probable that they are really very distinct. So far as regards their form and general appearance, they seem only to differ in having the anterior side rather more produced and sometimes wider.

"From this general resemblance, however, I have, in the absence of any knowledge of the nature of its cardinal teeth or pallial line, ventured to refer it provisionally to the same section of the *Mactra* group to which *Tellina nitidula* is now believed to belong, that is, to *Cymbophora* Gabb. I should have been inclined to refer it to *Macoma* or *Gastrana* were it not for the impressions of lateral teeth seen before and behind the beaks in the casts.

"*Locality and position.*—Whitish Cretaceous sandstone, East Canyon creek, Wasatch range, and near Coalville, Utah."

At Coalville this is one of the most abundant species in the strata below the principal coal bed, but they are all in the same state of preservation as the types. At first I was inclined to doubt whether the two forms represented by Meek's figures are really the same species, but after comparing a large series I am unable to find any constant differences by which they may be separated. Several specimens of the equilateral form show impressions of cardinal teeth like those of *Mactra*.

MACTRA EMMONSI Meek.

Pl. XXVII, Figs. 9-13.

Mactra ? emmonsi Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, Pt. 1, p. 153, Pl. 15, Fig. 8.

"Shell small, oval-subtrigonal, rather compressed, longer than high, nearly or quite equilateral, or with anterior side slightly longer than the other; basal margin forming a semielliptic curve; anterior margin narrowly rounded below the middle; posterior margin somewhat broader, most prominent and abruptly rounded or obtusely subangular below, and very faintly subtruncated obliquely above; dorsal margin sloping before and behind the beaks, the anterior slope being greater, with a concave outline; beaks nearly central, or sometimes placed a little behind the middle, rather depressed, and incurved with very slight obliquity; posterior umbonal slope very obscurely angular from the beaks to the posterior basal extremity. Surface only marked by fine obscure lines of growth. (Hinge and other internal characters unknown.)

"Length, 0.45 inch; height, 0.30 inch; convexity, 0.17 inch. Some specimens of apparently the same species are nearly double the size of that from which the above measurements were taken, and some of the smaller ones are proportionally a little shorter."

The figured type is a small sandstone cast somewhat distorted by pressure, and with the beak partially concealed in the matrix, so that it was drawn less prominent and more obtuse than it really is. It was

collected in the Cretaceous sandstone on East Canyon creek, Utah, where it is associated with *Cardium pauperculum* and other characteristic species of the Colorado fauna. Some much larger casts from about the same horizon, the first ridge in the Coalville section, are believed to belong to the same species, because of their close agreement in form, when allowance is made for the slight distortion of the type. One of these larger specimens is figured.

In the Pugnellus sandstone of Huerfano park, Colorado, one of the more abundant species is a small *Mactra* that in size and form is very like the above-mentioned Coalville specimens, and I think it best to describe and figure it under the same name, although one can never be certain that a well preserved shell, showing the surface characters, belongs to the same species with an imperfect internal cast from a distant locality.

The description of the form as above given serves very well for the Colorado examples, excepting that the most of them are proportionally more convex and many are not quite so elongate anteriorly. There is a large distinct lunule, lanceolate in form, bordered by an impressed line that extends from the beak to the extreme anterior end. Behind the angulation of the posterior umbonal slope there are one or two other faint radiating lines, the posterior of which forms the boundary of the escutcheon. Both the lunule and the escutcheon are marked by regular, distinct concentric lines. The remainder of the surface bears only lines of growth that are very faint and closely arranged, excepting toward the ventral border of adult specimens, where they become nearly equal in size to those on the lunule.

The hinge structure, so far as seen, is that of a *Mactra*; there is a cartilage pit, in front of which is an $\wedge$ -shaped tooth, and the lateral teeth are well developed. The pallial sinus is short and rounded.

This species has some resemblance to small examples of *Mactra warrenana*, which occurs in the upper portion of the Montana formation, but *M. emmonsii* is a more depressed form with a smoother surface and slight differences in outline, which are regarded of specific importance, especially when considered in connection with the difference in size and in stratigraphic position.

MACTRA HUERFANENSIS n. sp.

Pl. XXVII, Figs. 14 and 15.

Shell thin, depressed, subelliptical, nearly equilateral; anterior border regularly and rather narrowly rounded; posterior border forming a slightly convex regular slope from the beak to the subangular posterior end; base forming a broad regular curve; beaks small, projecting slightly beyond the cardinal border. Surface smooth, marked only by faint lines of growth.

This species varies considerably in length and in convexity. The specimens selected for figuring, representing the extremes of variation,

having the following dimensions, respectively: Length, 30 and 38^{mm}; height, 21 and 22^{mm}; convexity (of single valve), 5 and 4^{mm}.

The left valve has a medium-sized cartilage pit with a Λ -shaped cardinal tooth in front of it. Some of the casts show impressions of small lateral teeth. The anterior muscular impression is ovate or subcircular, the posterior, elongate ovate. Pallial sinus rather broad, rounded at the extremity, and horizontal. The structure of the hinge is determined from internal casts that do not show all the features clearly, so that it is impossible to say whether the species is a *Mactra* or some other allied genus.

I was at first inclined to identify these fossils with *Tellina? isonema* which they closely resemble in general form. They differ from that species, however, in that their surface is much smoother, lacking the regular concentric lines and also the angular posterior umbonal slope.

Locality and position.—In the Pugnellus sandstone at many localities in Huerfano park, Colorado.

MYIDÆ.

Genus CORBULA Bruguière.

CORBULA SUBTRIGONALIS M. & H.

Pl. XXVII, Figs. 7 and 8.

Corbula subtrigonalis Meek and Hayden, 1856, Proc. Acad. Nat. Sci. Phila., p. 116.

Corbula perundata Meek and Hayden, *ibid.*

Corbicula crassatelliformis Meek, 1871, Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 315.

Corbula tropidophora Meek, 1873, *idem* for 1872, p. 514.

Corbula subtrigonalis White, 1879, *idem* for 1877, p. 170; 1880, *idem* for 1878, p. 80, Pl. 25, Figs. 6a-f; 1883, 3d Ann. Rept. U. S. Geol. Sur., p. 442, Pl. 19, Figs. 10-13.

Compare *Corbula perangulata* Whiteaves, 1885, Cont. to Can. Palæont., vol. 1, p. 9, Pl. 1, Fig. 5a, b, Pl. 2, Fig. 1.

Shell large, transversely elongate-triangular; moderately convex, sub-equivalve, the right valve being slightly longer and more convex than the other; anterior end short, obliquely subtruncate above, regularly rounded below to join the ventral margin, which forms a regular, gently convex curve; posterior end narrow, greatly produced, subangular at the extremity; posterior dorsal margin straight or very slightly convex, forming approximately a right angle with the truncate anterior end; beaks prominent, incurved; posterior umbonal slope very prominent and angular in the left valve, more rounded in the right. A broad area immediately in front of the umbonal ridge is flattened, while the portion of the shell between it and the dorsal margin is abruptly deflected. Surface ornamented by fine lines of growth and a few larger concentric ridges.

Length of a large specimen, 33^{mm}; height, 21^{mm}; convexity of a single left valve, 7^{mm}.

The specimens here described were collected from coal-bearing sand-

stone of the Colorado formation at Bear River city, Wyoming (No. 12 of Meek's Sulphur creek section), where they are associated in the same layer with *Inoceramus labiatus*, *Cardium pauperculum*, *Pugnellus fusiformis*, etc. After comparing them with the types of all the forms that are now regarded as varieties of *Corbula subtrigonalis* I am unable to find any reason for their separation, excepting that some of them are larger than any other known specimens of *C. subtrigonalis*, and they come from a much lower horizon. The types all came from strata that have been referred to the Laramie, *C. subtrigonalis* and *C. perundata* from the mouth of Judith river, *C. tropidophora* and *Corbicula? crassatelliformis* from the Bitter creek series of southern Wyoming. It should be stated that some examples in the Bear River city collections agree perfectly with the varieties described as *C. perundata* and *C. crassatelliformis*. Whiteaves reports the occurrence of the species in the Belly River series, which is supposed to hold the position between the Colorado and Montana formations, and I have found it at Coalville, Utah, in the "third ridge," above the Carleton coal bed, which is referred to the Montana formation. The species therefore seems to range through nearly all of the Upper Cretaceous, from the Colorado to the Laramie inclusive, and from purely marine to brackish water beds. The well-known fact that recent marine representatives of the genus are not essentially different from those inhabiting the almost fresh waters of estuaries and the mouths of rivers makes it less surprising that in the course of time a species should pass from one of these kinds of habitat to the other without material change.

CORBULA NEMATOPHORA Meek.

Pl. XXVII, Figs. 3 and 4.

Corbula nematophora Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 496; White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 188, Pl. 17, Fig. 7; 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 290, Pl. 3, Figs. 4a-d.

Original description:

"Shell of about medium size, ovate-subtrigonal, nearly equivalve and moderately convex, with height equaling two-thirds the length; anterior outline rounded; base semiovate; posterior extremity somewhat produced and subangular or minutely truncated in outline below; dorsal outline sloping from the beaks, the anterior slope being more abrupt and slightly concave in outline above, and the posterior longer and nearly straight, with a greater obliquity; posterior umbonal slopes more or less angular in each valve from the beak to the posterior basal extremity; beaks rather prominent and placed about one-third the length of the valves from the front. Surface ornamented by small, regular, concentric ridges, or strong lines and furrows, both of which are more distinct on the right valve than on the left, where they are sometimes obsolete.

"Length of largest specimen seen, 0.50 inch; height, 0.32 inch; convexity, 0.25 inch."

Prof. Meek noted the close resemblance of this species to certain Laramie forms that are now regarded as belonging to *Corbula subtriangularis*, and it may be that they are identical. It often happens that very closely related forms of this genus are found at greatly separated horizons, and for this reason, though a great many fossil species have been named, they can seldom be used with any certainty in correlating strata.

Locality and position.—The types came from coal-bearing Cretaceous beds near Cedar City, Utah, apparently equivalent with the lower part of the Coalville section. The species is common beneath the main coal bed at Coalville, Utah, and in the "third ridge" of the same section I have collected specimens that seem to belong to it.

CORBULA KANABENSIS n. sp.

Pl. XXVII, Figs. 5 and 6.

Shell small, ventricose, subequivalve, equilateral, transversely ovate in outline; front end broadly rounded, forming a regular curve from the beak to the base; posterior end abruptly contracted and angular; beaks large, prominent, approximate; posterior umbonal slope subcarinate; basal margin usually thickened, and inflected so as to form a flattened band. Surface bearing fine regular concentric lines.

Length of a medium-sized specimen, 10^{mm}; height, 7^{mm}; convexity of both valves united, 5^{mm}.

Corbula traski, from the Chico group of California as figured by Gabb¹ and by Whiteaves,² is very much like this species, and direct comparison of specimens may show that they are identical, but judging from the figures and description *C. traski* is more inequivalve and less regularly convex, and it lacks the angular umbonal slope and the thickening and deflection of the ventral border.

Locality and position.—About 350 feet above the base of the Cretaceous section in Upper Kanab valley, southern Utah.

PHOLADIDÆ.

Genus PARAPHOLAS Conrad.

PARAPHOLAS SPHENOIDEUS White.

Pl. XXVII, Figs. 1 and 2.

Turnus sphenoides White, 1876, Geol. Uinta Mts., p. 117.

Parapholas sphenoides White, 1879, Ann. Rept. U. S. Geol. Sur. for 1877, p. 300, Pl. 5, Figs. 1a-d.

Revised description:

"Shell elongate, cuneate, inflated in front, narrowed and laterally compressed behind; beaks anterior, incurved, adjacent; dorsal margins

¹Palæont., California, vol. 1, Pl. 22, Fig. 121.

²Mesozoic Foss., vol. 1, Pl. 17, Fig. 3.

of the valves straight and sloping from the beaks to the posterior end, capped or connected by a slender styliform, plain accessory plate; posterior extremity small, truncated, or narrowly rounded; basal margins nearly straight, connected by a ventral accessory plate similar to the dorsal one, except that it is shorter, broadest behind, but coming to a slender point in front about midlength of the shell, longitudinally divided by a linear groove; front regularly rounded, both vertically and laterally; anterior gape consisting of a narrow, vertical slit, which occupies the middle of a somewhat prominent projection at the antero-basal portion of the shell, which projection has the shape of a Norman shield, as seen by front view when both valves are in their natural position, and which seems to have been occupied by a much wider gape in the younger than in the adult condition of the shell; both umbonal grooves distinct, both upon the outer surface and upon that of the stony cast; anterior grooves broader and deeper than the other, but both are slender; besides the two umbonal grooves there is another somewhat broader groove or furrow, extending with a broad, downward curve from the posterior side of the beak to the posterior end of the shell. This groove, like the others, is distinctly traceable upon the outer surface, but is more distinctly seen upon the stony cast.

"A broad, subcircular, cake-like umbonal accessory valve covers the beaks and the space between them, the valve being divided by a suture into two nearly semicircular pieces so neatly that it is hardly perceptible until the valves are slightly displaced. The margins of the principal valves between the beaks and the Norman shield-shaped projection are narrowly but abruptly everted, which, with the beaks above and the borders of the projection below, bound a distinctly hollowed space on each side and below each beak. Besides the grooves before mentioned, the surface is marked by fine concentric, distinctly raised lines on each side of the shell, but they are less distinct upon the surface of the Norman shield-shaped projection than elsewhere. Between the posterior grooves or furrow before mentioned as ending at the posterior margin of the shell and the dorsal margin, the surface is occupied by strong, irregular scales and laminae that were successively left as the shell increased in size.

"Length, 13^{mm}; greatest height, 7^{mm}; breadth at front, 6^{mm}."

For extended comments on the generic relationship of this species, see Dr. White's remarks in the second work above referred to.

Comparison of this species with *Parapholas californica*, the type of the genus, leaves little room for doubt that they are congeneric, but it seems to me that it is still an open question whether *Parapholas* is really distinct from *Martesia*.

Locality and position.—Upper Kanab valley, Utah, and near the base of the Coalville section. Specimens from the latter place are mentioned by Meek¹ as "*Martesia* (undetermined sp.)."

¹Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 476.

PARAPHOLAS? sp.

A bit of fossil wood collected in the Pugnellus sandstone of Poison canyon, Colorado, contained several short tubes of a boring mollusk that may belong to this genus. The large end of the tube is rounded and it tapers rapidly toward the posterior end. It seems to be a much shorter species than *Parapholas sphenoides*.

GASTROPODA.

NERITIDÆ.

Genus NERITINA Lamarck.

NERITINA PISUM Meek.

Pl. XXVIII, Figs. 1-3.

Neritina (Neritella) pisum and *N. pisiformis* Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 500.

Neritina pisum White, 1879, idem for 1877, p. 308, Pl. 7, Figs. 11a-c.

Neritina pisiformis White, 1880, idem for 1878, p. 26, Pl. 12, Figs. 9a-c.

The original description of *Neritina pisum* is as follows:

"Shell globose; spire much depressed; volutions about three, rapidly increasing in size, so that the last or body turn (which is a little depressed above) composes nearly the entire shell; inner lip broad, flattened, and smooth; aperture small and semicircular; surface nearly or quite smooth.

"Height, 0.22 inch; breadth, 0.26 inch."

On the same page the following description of *Neritina pisiformis* is given:

"Shell small, subglobose, or obliquely rhombic, the height being slightly less than the oblique breadth; spire rather prominent for a species of this genus; volutions three to three and a half; convex; last one large, and forming most of the bulk of the shell; aperture subovate, considerably contracted by the flattened, moderately wide inner lip, which is nearly straight on its inner margin, and provided there with four small denticles, the upper one of which is largest. Surface smooth.

"Height, 0.30 inch; greatest oblique breadth, 0.32 inch.

"This little shell agrees so nearly in size and form with the described species (*N. pisum*) that they may be readily confounded, as they are found with the aperture filled with rock. A fortunate fracture of one of the specimens exposed the inner edge of its flattened columnella, however, and thus enabled me to see that it is denticulated, and in this respect differs from *Neritina pisum*, which seems to be entirely without teeth. Further comparisons also show the two shells to differ in form, that under consideration having a more prominent spire and a more globose outline, being less oblique."

On attempting to separate collections from the typical locality into

two species as above described, it was soon evident that they could not be separated by form alone because they vary in that respect, showing every gradation between the extremes represented by the types. The type of *N. pisum* was then studied more closely, and the rock was removed from the aperture, revealing the fact that the inner lip is denticulate as in *N. pisiformis*. Consequently the latter name must be regarded as a synonym of *N. pisum*.

Locality and position.—Near the base of the Cretaceous section at Coalville, Utah.

NERITINA INCOMPTA White.

Pl. XXVIII, Figs. 4 and 5.

Neritina incompta White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 308, Pl. 7, Figs. a-c.

Original description:

"Shell transversely elongate when adult; spire depressed, abruptly convex, small, but rising perceptibly above the body-volution; volutions three and a half or four, increasing rapidly in size, the last one comprising much the greater part of the shell, regularly convex or with a faint appearance of flattening upon the distal side of the last one; suture moderately distinct; aperture rather large, its outer border regularly rounded, proximal, and distal margins slightly convex and subparallel; outer lip thin-edged, inner lip moderately long, plain, slightly concave upon its face, not very broad, sloping inward. Surface marked by ordinary lines of growth.

"Length, in direction of the axis, 12^{mm}; breadth, across the aperture and body-volution, 17^{mm}.

"This species resembles *N. bannisteri* Meek from the brackish-water layers of the same formation at Coalville, Utah; but it differs in the greater, although slight, elevation of the apex, the nearly straight, instead of curved, border of the inner lip, and its nonpolished surface."

Locality and position.—Valley of Sulphur creek, near Hilliard station, Wyoming, in strata that are now believed to belong to the Colorado formation.

NERITINA (VELATELLA) PATELLIFORMIS Meek.

Pl. XXVIII, Figs. 6-10.

Neritina (Dostia?) patelliformis Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 498.

? *Neritina (Velatella) carditoides* White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 189, Pl. 18, Fig. 7a-c.

Neritina (Velatella) patelliformis White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 309, Pl. 7, Figs. 7a-d.

Neritina (Velatella) patelliformis var. *weberensis* White, 1879, ibid. Pl. 7, Figs. 8a and b.

Original description.

"Shell small, thick, oval, or subelliptic; nucleus nearly posterior and generally more or less elevated above the posterior margin, but

always lower than the middle portion of the dorsal region in front of it, directed obliquely backward, and in well-preserved specimens minutely subspiral at the immediate, more or less oblique apex; inner lip very broad, or having the form of a thick, smooth, convex septum that extends forward more than half the length of the shell; outer lip thickened, obtuse and smooth within; open part of the aperture small and transversely semicircular. Surface with moderately distinct lines of growth.

“Length of one of the largest specimens found, 0.62 inch; breadth, 0.50 inch; height or convexity, 0.33 inch.”

The variety *weberensis* White, which was found in the same layer with the typical form, was described as follows:

“Shell small, depressed, almost regularly elliptical in outline, nearly regularly convex above, and nearly flat or longitudinally slightly concave beneath; beak very small, apparently making about one revolution, turned a little to the dextral side of the shell, resting upon the thickened posterior margin, but not projecting beyond it, the posterior margin being slightly reflexed so as to obscure the incurved apex; inner lip broad, smooth, flat, or concave longitudinally, and slightly convex laterally, apparently occupying more than half the under surface of the shell; outer lip moderately thin, smooth, or at least not crenulate. Surface marked by ordinary lines and undulations of growth, and upon the middle portion of the anterior half by five or six narrow, slightly raised, obscure, radiating ribs, with spaces between them a little wider than the ribs. In some cases there are also other obscure radiating lines upon the anterior flanks of the shell.

“Length, 11^{mm}; breadth, 8^{mm}; height, 5^{mm}. Some examples in the collection are larger, but none of them quite equal in size the larger examples of the typical forms of the species.

“This variety, although perhaps connecting the typical forms with *N. (V.) carditoides* Meek, differs from it in the number and character of its costæ, the proportions of the shell, and its smaller size. At one time I thought, as did also Mr. Meek, that this variety might prove to be specifically distinct from the typical forms of *N. (V.) patelliformis*, but study of collections since made at the typical locality shows that intermediate forms exist, associated with this variety and the typical forms in the same layer.”

It should be added that the inner lip of this species is slightly denticulate on the margin.

The name *Velatella* was proposed by Meek as a subgenus of *Neritina* to include this and a few other Cretaceous species. It was adopted by White, who gave a diagnosis of it in the Ann. Rept. U. S. Geol. Sur. of the Territories for 1878, p. 27. It seems to me to be scarcely distinct from *Dostia*, from which it differs “in its more nearly perfect bilateral symmetry and its minute apex.”

Locality and position.—Abundant in certain layers near the base of
Bull. 106—9

the Cretaceous section at Coalville, Utah, and in equivalent beds at Bear River city, Wyoming. *Neritina carditoides*, which is a closely related but probably distinct species, occurs at a much higher horizon in the "third ridge" of the same section.

TURRITELLIDÆ.

Genus TURRITELLA Lamarck.

TURRITELLA WHITEI n. sp.

Pl. XXVIII, Figs. 12-16.

Turritella uvasana White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 195, Pl. 18, Figs. 11a and b.

Not *Turritella uvasana* Conrad, 1856, Pacific Railroad Repts. vol. v., p. 321.

This species was first obtained from Cretaceous strata southeast of Paria, Utah, and was doubtfully referred to *Turritella uvasana*, a species of the Tejon formation of California.

Dr. White describes the Utah specimens as follows:

"Shell of ordinary size, elongate, slender; sides straight; volutions numerous, apparently reaching eighteen or twenty when full-grown; the sides of the volutions nearly straight or only slightly convex; suture broad, deeply impressed.

"Surface marked by numerous revolving raised lines, six or eight of which are moderately large, the smaller ones alternating with them. The larger lines are minutely nodose upon the larger volutions, and upon the last one they are even subspinulose.

"All the specimens of this species in the collection are more or less broken, but judging from the apical angle indicated by their sides, the largest must have been about $5\frac{1}{2}$ centimeters long, and its last whorl about 13 millimeters in diameter."

Since the above description was published, Mr. C. D. Walcott has collected a number of good specimens at Upper Kanab, Utah, and the writer has more recently obtained a great many from the Pugnellus sandstone of Huerfano park, Colorado. The study of this additional and better material has proved that it differs from Conrad's species in several particulars. The revolving lines of *Turritella uvasana* are not nodose, the apical angle is less than in our species, and the whorls are broader, so that there is a less number of volutions in a given length of specimens of the same size, and it is probable that the total number of volutions is less in the California species. Some young specimens of *T. whitei* (or tips of old ones) from Upper Kanab have about twenty volutions in a length of a little over half an inch, and the diameter of the last whorl is only 3 millimeters, or about the same as the upper end of the specimen represented by Fig. 12 on Pl. XXVIII. An individual of that size would, therefore, have about thirty volutions when complete.

These differences are sufficient basis for the separation of the two forms, and the additional fact that one of them occurs near the base of the Upper Cretaceous, while the other is found at the very top of the Cretaceous—or in the Eocene—makes their separation still more reasonable.

It should be stated that the specimens from Colorado do not quite agree in ornamentation with those from Utah. The revolving lines are somewhat broader and fewer in number, usually not more than five or six prominent ones, and the intermediate fine thread-like lines are often obsolete. Perhaps such differences are of specific importance, but it seems to me more probable that they are only local variations of one species. If it should ever be found desirable to separate them the Utah form must be regarded as the type of *Turritella whitei*.

At a locality about 12 miles east of Walsenburg a number of specimens of the Colorado variety were found in a peculiar state of preservation that gives them a very different aspect. The shell is entirely replaced by calcite and the surface is eroded until there is hardly a trace of the natural ornamentation remaining. The planing down of the rounded whorls has left irregular zigzag lines that are, in some cases at least, coincident with the angles of the calcite crystals. One of these is figured.

Locality and position.—About 350 feet above the base of the Cretaceous section in Upper Kanab valley, Utah; in the Pugnellus sandstone of Huerfano park, Colorado, and at about the same or a little lower horizon in the Benton shales on the Arkansas river above Pueblo, at Rattlesnake butte, and other places in southern Colorado.

TURRITELLA MICRONEMA Meek.

Pl. XXIX, Fig. 3.

Turritella (Aclis?) micronema Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 504; White, 1879, idem for 1877, p. 316, Pl. 9, Fig. 8a.

Original description:

“Shell small, terete or elongate-conical; volutions about nine, nearly flat, sometimes moderately convex, increasing gradually in size, last one rounded or obscurely subangular in the middle; suture linear to moderately distinct; aperture rhombic-ovate, angular above. Surface ornamented by fine, regular, rather crowded revolving lines, six or eight of which may be counted on each volution of the spire.

“Length of the largest specimen seen, 0.50 inch; breadth, 0.18 inch; angle of spire, about 19° , with slightly convex slopes. [Specimens since found at the original locality, and in the same layers, indicate a size nearly twice as great as this.]

“This may not be a *Turritella*, the specimen not being in a condition to show the texture of the shell or to give a clear idea of its aperture and lip. It would be a rather small species for that genus, and if it

possessed the delicacy of surface seen in those genera, it might perhaps with more propriety be referred to *Aclis* or *Menestho*. The fractured lip in some of the specimens has somewhat the appearance of a slight angularity or very small notch at the base of the aperture, but this may be due to the manner in which it is broken; if not, it would seem to present affinities with the genus *Mesalia*. It will be readily distinguished from the species I described under the name *T. spironema* by its less attenuated form and finer and less distinct revolving lines. It is also not nearly so attenuated toward the upper part of the spire as that species.

“*Locality and position.*—Coalville, Utah, from the Cretaceous below the heavy bed of coal mined at that place.”

Genus GLAUCONIA Giebel.

GLAUCONIA COALVILLENSIS Meek (sp.).

Pl. XXVIII, FIG. 11; Pl. XXIX, Figs. 1 and 2.

Turritella coalvillensis Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 502;

White, 1879, idem for 1877, p. 315, Pl. 9, Fig. 4a.

Cassiope whitfieldi White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 196, Pl. 18, Fig. 1a.

Original description of *Cassiope whitfieldi*:

“Shell moderately large, elongate-conical, umbilicate; volutions apparently about twelve, prominent and prominently angular below the middle of the visible portion, slightly concave from the prominent revolving angle to the suture below, also very slightly and somewhat irregularly concave from that angle to the suture above. A little below the suture there is a rather small, shallow furrow, with its borders above and below raised into more or less distinct revolving ridges. Upon the under side of the last volution, which is rather strongly convex, there are three small revolving ridges, one of them bounding the umbilicus; the other two are placed near each other above the middle of the space, and are continuous to the apex of the shell. It is between the two last-named ridges that the hinder edge of each succeeding volution joins the preceding one. Umbilicus moderately large and deep; aperture subovate in outline; outer lip sinuate, having a broad, shallow notch above its middle, projecting somewhat anteriorly, and rounded abruptly into the umbilicus.

“Surface marked by more or less strong undulating lines of growth apparently without small revolving lines.

“Diameter of the last volution of our largest example, nearly 4½ centimeters; the full height of the same, when entire, must have been not far from 11 centimeters.”

Turritella coalvillensis was originally described from fragments that are more or less eroded and do not show the umbilicus. When better preserved specimens were obtained from southern Utah they were

described as a new species and referred to *Cassiope*, which according to the manuals of Zittell and Fischer is a synonym of *Glauconia*.

In the more recent collections from Coalville there are several examples that unquestionably belong to Meek's species and yet they possess the umbilicus and other characteristic features of *Cassiope whitfieldi*.

The surface ornamentation varies considerably in different individuals. In some examples each whorl of the spire bears five well marked revolving ridges, two of which are adjoining the suture above and below, respectively, while the other three are close together in the middle of the whorl and the lowest of them is the largest, giving to the whorl its angular appearance. In other specimens, especially very large ones, one or both of the ridges immediately above the angle is obsolete.

Turritella martinezensis Gabb, from the Cretaceous of California, resembles this species quite closely both in form and ornamentation, but it is not umbilicate.

Locality and position.—Near the base of the Cretaceous section at Coalville, Utah, and at various localities in southern Utah.

XENOPHORIDÆ.

Genus XENOPHORA Fischer von Waldheim.

XENOPHORA SIMPSONI n. sp.

Pl. XXIX, Figs. 4-6.

Shell small, trochiform, consisting of four or five volutions; spire moderately elevated with straight sides; periphery of last volution narrow, angular and somewhat produced; base nearly flat, with a rather small but distinct umbilicus. The aperture is very oblique, irregularly oval in outline, and with the inner lip slightly thickened. Surface of the spire marked by numerous faint, irregular pits and depressions that seem to have been caused by the adhesion of small pebbles and bits of shell in the manner that is characteristic of this genus. These irregularities of the surface are shown on internal casts almost as distinctly as on the shell itself. The surface also shows lines of growth that are especially prominent and strongly curved on the base of the shell.

Height of one of the largest specimens, 10^{mm}; greatest breadth, 16^{mm}.

There is no other described species in the American Cretaceous with which this need be compared, though comparisons with recent species show that it certainly belongs to *Xenophora*. There are 21 specimens in the collection, all more or less imperfect, but taken together they show all the characters of the species.

The name is given in honor of Mr. Charles T. Simpson, of the U. S. National Museum.

Locality and position.—In the Pugnellus sandstone near Malachite post-office, and in Poison canyon, Huerfano park, Colorado; at the same or a somewhat lower horizon on the Arkansas river, 20 miles above Pueblo, Colorado.

NATICIDÆ.

Genus LUNATIA Gray.

LUNATIA CONCINNA Hall & Meek (sp.).

Pl. XXIX, Figs. 9 and 10.

Natica concinna Hall & Meek, 1856, Mem. Am. Acad. Arts and Sci., n. s. vol. v, p. 384, Pl. 3, Figs. 2a-d.

Natica moreauensis Meek & Hayden, 1856, Proc. Acad. Nat. Sci., Phila., p. 64.

Lunatia concinna Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 314, Pl. 32, Figs. 1a-c; Whitfield, 1880, Geol. Bl. Hills of Dak., p. 430, Pl. 12, Fig. 13.

Compare *Natica obliquata* Hall & Meek, 1856, op. cit., p. 384, Pl. 3, Figs. 1 a and b; and *N. rectilabrum* Conrad, Jour. Acad. Nat. Sci., Phila., 2d ser., vol. iv, p. 344, Pl. 58, Fig. 28.

Prof. Meek's revised description is as follows:

"Shell obliquely rhombic-subovate, or subglobose; spire moderate; volutions three and a half to four, convex, and separated by a deep suture, last one comparatively large; surface marked by fine, rather obscure, lines of growth, crossed by nearly obsolete, minutely flexuous, revolving striæ, only seen on well-preserved specimens; aperture subovate, being straighter on the inner than the outer side; umbilicus, small and sometimes showing a slight tendency to develop a small revolving ridge within; inner lip a little thickened and slightly reflected upon the body volution above the umbilicus.

"Length of a mature rather gibbous specimen, 0.90 inch; breadth of same, 0.76 inch.

"This shell varies somewhat in form, some individuals being proportionally a little shorter, and having the body volution more ventricose than others. For a long time it was believed to be distinct from *N. concinna*, and consequently the name *N. moreauensis* was proposed for it. Since seeing a good series of specimens, however, showing the form and general appearance of the shell at various stages of growth, I am led to believe that it is not specifically distinct from the type of *N. concinna*, which is now believed to be a young individual. At any rate, small specimens before me of the same size seem to agree almost exactly with the type of *N. concinna*, while I am at a loss to separate these specifically from the larger individuals, such as those for which the name *N. moreauensis* was proposed."

The author then proceeds to compare this with the closely related species *Natica obliquata* and *N. rectilabrum*. According to Mr. Gabb all the names given above, and *N. acutispira* Shumard, are synonyms of *Lunatia obliquata*. This conclusion is quite probable, but I am unable to confirm it with the material at hand.

The collections from Upper Kanab valley, Utah, contain 9 specimens, two of which are figured, that are not distinguishable from rather small examples of this species. The inner lip is perhaps slightly straighter, the callous deposit smaller and the outer lip is somewhat less oblique, but in form and surface markings they agree almost exactly. The principal fact that causes me to hesitate to assign them to the described species is that they come from a lower horizon and nearly all of their associates are different. The types and all the specimens hitherto reported, with one exception, came from the upper portions of the Montana formation, and from its equivalents in the southern states. In the Geology of the Black Hills of Dakota, Mr. Whitfield states that one cast not distinguishable from this species came from a much lower horizon, probably the Benton shales.

Locality and position.—About 350 feet above the base of the Cretaceous section in Upper Kanab valley, Utah.

Genus GYRODES Conrad.

GYRODES DEPRESSA Meek.

Pl. XXIX, Figs. 11-14.

Gyrodes depressa Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. iv., Pt. 1, p. 159, Pl. 15, Figs. 1 and 1 a.

Shell depressed subglobose, consisting of three or four rapidly increasing whorls, the last of which is very large; spire varying from depressed to moderately elevated and prominent; whorls in some examples distinctly truncate above, in others only slightly flattened or simply rounded to the distinct, impressed suture, subangular or very narrowly rounded below around the borders of the umbilicus, which is broad and deep, but narrows rapidly within. Aperture ear-shaped, subangular above and broadly rounded below, oblique to the axis of the shell; outer lip forming an irregular curve; inner lip nearly straight and with the upper half reflexed and somewhat thickened. Surface marked by strong lines of growth.

Height of an average specimen, about 22^{mm}; the greatest breadth, 32^{mm}. In some of the more elevated examples the height and breadth are nearly equal.

This description is drawn from a large suite of well-preserved specimens obtained in Huerfano park, Colorado, that have been compared with the types and with other examples from the typical locality. The types are sandstone casts, more or less distorted by pressure, so that the spire is unnaturally low. In the original description the suture is said to be "channeled in such a manner as to be flattened within, owing to the presence of a revolving furrow just above it," but this feature is accidental, the flattened channel simply representing the thickness of the shell between the whorls. I have no doubt that the Colorado shells

belong to Meek's species, especially since many of the associated forms are identical in the two regions.

The extreme forms represented by Figs. 11 and 14 seem sufficiently different to be regarded as distinct species, but there are many intermediate forms and every character by which they might be separated is variable, consequently I shall include them all under the one name for the present. The most nearly related species with which I am acquainted is *Gyrodes petrosa* Morton (sp.), from the Ripley formation of the Atlantic and Gulf border regions.

Locality and position.—In the lower portion of the Cretaceous section at Coalville, Utah, ranging upward to the top of the "second ridge;" abundant in the Pugnellus sandstone at many localities in Huerfano park, Colorado.

GYRODES CONRADI Meek.

Pl. XXIX, Figs. 7 and 8.

Gyrodes conradi Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 310, Figs. 33-36 in text.

Original description:

"Shell obliquely depressed-subglobose, the height being about seven-eighths the breadth; volutions four to five, increasing rapidly in size, the last one forming about nine-tenths of the entire bulk, rounded on the outer side, somewhat produced and acutely carinated around the middle below, and, like those of the spire, with the truncation of the upper edge moderately broad and a little concave; spire much depressed; umbilicus very broad and somewhat funnel-shaped, with its marginal angle prominent, acute, and regularly and rather distinctly crenate, while some distance within there is a second less prominent, linear, revolving ridge; aperture sub-rhombic and about twice as high as wide, distinctly angular at the termination of the revolving carina of the under side of the body-volution below, and obtusely angular above; outer lip very oblique, being produced above, and thence nearly straight, and extending obliquely backward and downward to the basal angle, where it connects with the lower extremity of the thin inner lip by a small, sharp sinus, or emargination; surface nearly smooth, or having obscure lines of growth, that become stronger and show a tendency to gather into little wrinkles on the upper truncated part of the volutions, while on well-preserved specimens the faintest possible traces of fine revolving striæ may be seen by the aid of a magnifier.

"Height, 0.91 inch; breadth, about 1.10 inches; height of aperture, 0.86 inch; breadth of same, 0.43 inch."

Some larger specimens from Huerfano park, Colorado, are proportionally somewhat more elevated and have a narrower umbilicus than the type, with which they agree in all other respects.

This species is very closely related to *Gyrodes pansus* Stoliczka, from the Cretaceous of southern India, and it may also be compared with *G. crenata* Conrad, from the Ripley formation.

Locality and position.—The type was found on Cheyenne river, South Dakota, in strata supposed to belong to the Fort Benton shales. The additional examples above mentioned came from the Pugnellus sandstone on Williams creek and Poison canyon, Huerfano park, Colorado.

Genus AMAUOPSIS Mörch.

AMAUOPSIS BULBIFORMIS Sowerby (sp.).

Pl. xxx, Figs. 2-4.

Natica bulbiformis Sowerby, 1832, Trans. Geol. Soc. Lond., 2d ser., vol. III, p. 418, Pl. 38, Fig. 13; d'Orb., Pal., Franç., Terr. Crét., Gastéropodes, p. 162, Pl. 174, Fig. 3; Goldfuss, Petrefacta Germ., p. 112, Pl. 199, Figs. 16 and 17; Zekeli, Die Gastropoden der Gosaugebilde, p. 45, Pl. 8, Fig. 2.

Ampullina bulbiformis Stoliczka, Sitzungsber. k. Akad. d. Wissenschaften, Wien, Bd. 52, p. 146; Pal. Indica, Cretaceous Fauna of Southern India, vol. II, p. 300, Pl. 21, Figs. 11-15.

Compare *Amauopsis alveata* (Con.) Gabb, Pal. California, vol. I, p. 110, Pl. 19, Fig. 59.

Shell large, elongate-ovate, not umbilicate, consisting of seven or eight rapidly increasing, moderately convex, shouldered whorls; spire elevated and prominent, the apical angle varying from about 50° to 65° ; sutures deeply channeled; aperture elongate-ovate, contracted behind where it is separated from the body of the shell by the channeling of the suture, somewhat produced and subangular in front; outer lip thin and sharp; inner lip nearly straight, moderately thick, anteriorly flattened, and reflected so as to form a sharp projecting ridge. Surface marked by lines of growth and by numerous revolving lines of minute punctations that are always visible on well preserved specimens, and on a few examples are situated in well-defined revolving furrows, giving the shell in these rare cases a distinctly striate appearance.

Length of an average specimen, 77^{mm} ; breadth, 47^{mm} . The length of the largest specimen in the collection is 92^{mm} .

I have seen no good European examples of this species with which to make direct comparisons, but, judging from the published figures and the comments of the authors who have described it, it is quite variable in form, several of the published figures differing more from Sowerby's original drawing than our specimens do. In those in which the aperture is represented as complete it is more broadly and regularly rounded than in the shells before me. This and other very slight differences that might be pointed out do not seem to me sufficient basis for proposing a new name. The species is already known to have had a wide geographic range in Cretaceous time, as it occurs in the Turonian of France, in the Gosau beds of Austria, and in the Cretaceous of southern India, where it is said to range through the entire Cretaceous series developed there. I suspect that some of the California fossils referred by Gabb to *Amauopsis alveata* really belong to this species, although he states that they are umbilicated.

I follow Zittel in referring this species to *Amauropsis*.

Locality and position.—Common in the Pugnellus sandstone at several localities in Huerfano park; rare in the upper part of the Benton shales on the Arkansas river above Pueblo, Colorado.

AMAUOPSIS? UTAHENSIS White (sp.).

Pl. xxx, Fig. 1.

Lunatia utahensis White, 1876, Geol. Uinta Mts., p. 122.

Euspira coalvillensis White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 310, Pl. 4, Figs. 2a and b.

Revised description:

“Shell subglobose; spire small, conical, acute, but not much extended; volutions about eight when the apex is entire, last one inflated, and, when adult, extended a little in front, and also posteriorly, near the border of the aperture; aperture obliquely ovate-semilunar, somewhat abruptly rounded anteriorly; callus of the inner lip apparently not much thickened, but thicker anteriorly than posteriorly; columnella rimate or almost solid, and nearly covered by the callus of the inner lip, which seems not to be so closely appressed against it as it is against the body-volution farther back. Surface marked by the ordinary lines of growth. The figures on plate 4 are restorations of this species, all the numerous examples in the collections being crushed except one or two sandstone casts. The examples being somewhat numerous, afford a view of all the features shown by the figures.

“Length, from the apex to the anterior end of the aperture, about 4^{cm}; breadth, across the aperture and body-volution, about 3½^{cm}.”

The material on which this species was based is very imperfect and unsatisfactory, though it seems to justify the restoration given in the figure. In the National Museum collection there is one specimen, from another locality, of the same general form, that has a broad, open, *Gyrodes*-like umbilicus, but it seems hardly possible that it can belong to this species, or even to the same subgenus.

In the second publication of the species the specific name was inadvertently changed from *utahensis* to *coalvillensis* and the original name was restored by the same author.¹

According to Zittel² *Euspira* can not be retained even as a subgeneric name, and forms without an umbilicus resembling this and the species described above are by him referred to *Amauropsis*, though it seems to me that the species now under consideration might be referred with equal propriety to *Ampullina* or to *Cernina*.

Locality and position.—Near the base of the Cretaceous section at Coalville, Utah.

¹ Ann. Rept. U. S. Geol. Sur. Terr. for 1878, p. 29.

² Handbuch der Paläontologie, II, p. 221.

Genus SIGARETUS Lamarck.

SIGARETUS (EUNATICINA?) TEXTILIS n. sp.

Pl. xxx, Figs. 5 and 6.

Shell thin, broadly ovate, consisting of three or three and a half rapidly increasing volutions, the last one forming the greater part of the entire bulk; suture linear, impressed; aperture large, rhombic ovate, narrow and produced behind, broad and sinuous in front, the greatest breadth being in front of the middle; outer lip thin and sharp, irregularly convex in outline; inner lip somewhat thickened and reflected, almost covering the narrow umbilical chink; columella arched. The inner lip is also concave in the middle, so that it and the narrow umbilicus are concealed when the aperture is filled with rock.

Surface marked by distinct revolving filiform lines that are not quite a millimeter apart on the body whorl, and by crowded, wavy transverse lines that are just visible to the unaided eye. On several of the specimens the revolving sculpture is very faint on an area of 2 or 3^{mm} wide bordering the outer lip, and the lines of growth are there more distinct.

Length of the largest type, 15^{mm}; breadth, 12^{mm}.

The generic relations of this species are rather obscure, and the specimens in hand are not very well preserved. Mr. Charles T. Simpson, of the department of mollusks, U. S. National Museum, through whose courtesy I was enabled to make comparisons with recent species, decides that it is most nearly related to *Sigaretus* and to the subgenus *Eunaticina* of Fischer (= *Naticina* Gray).

Naticina obliqua Gabb, from the Tejon formation of California, is the only other American species that has been referred to the Cretaceous, and it is plainly different from ours.

Locality and position.—Upper Kanab valley, Utah, about 300 feet above the base of the Cretaceous section.

RISSOIDÆ.

Genus MESOSTOMA Deshayes.

MESOSTOMA OCCIDENTALIS n. sp.

Pl. xxx, Figs. 7 and 8.

Shell scalariform, with about eight or nine convex whorls; sutures deeply impressed. Surface marked by numerous moderately strong transverse costæ, that pass entirely across the whorl and are about as broad as the interspaces, and by more closely arranged, fine, revolving lines. On each of the larger whorls there are about twenty of the transverse costæ and about twelve or fifteen revolving lines.

The aperture is obliquely ovate in outline, slightly narrowed behind and a little produced or sub-canaliculate in front. Outer lip thin and sharp; inner lip somewhat reflexed and thickened below; peritreme not continuous, columnella somewhat arcuate.

Length of one of the types with the apex restored, about 13^{mm}; greatest diameter, about 5^{mm}. Some fragments of the same species evidently belong to shells with about double these dimensions.

With the imperfect material with which the paleontologist must usually deal, it is very difficult to assign such forms as this to the genus to which it belongs. Its general form and the character of the ornamentation are duplicated in *Cerithium*, *Scaloria*, and *Rissoa*, or at least in species that have been referred to those genera. The fact that in our species the peritreme is not continuous prevents its reference to either *Scaloria* or *Rissoa*. It seems to be very nearly related to some of the Cretaceous species of *Mesostoma* figured by Holzapfel,¹ and I have therefore placed it provisionally in that genus rather than in *Cerithium*. No described species from the American Cretaceous known to me is nearly related to this one, though *Cerithium lallierianum* var. *suciense* Whiteaves, seems to belong to the same general type.

Locality and position.—In the Pugnellus sandstone, at several localities in Huerfano park, and in the upper part of the Benton shales on the Arkansas river above Pueblo, Colorado.

PYRAMIDELLIDÆ.

Genus EULIMELLA Forbes.

EULIMELLA? FUNICULA Meek.

Pl. xxx, Fig. 9.

Eulima funicula Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 506.

Eulimella? funicula White, 1876, U. S. Geog. and Geol. Sur., West 100th Meridian, Vol. iv, p. 197, Pl. 18, Fig. 6; 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 316, Pl. 9, Fig. 10a.

Original description:

“Shell subterete or elongate-conical; spire regularly tapering from the middle of the body volution to the apex, or with very slightly convex slopes; volutions about twelve, flattened; last turn not much enlarged, subangular around the middle; suture merely linear; aperture ovate or rhombic-subovate; inner lip slightly thickened and reflected. Surface smooth.

“Length, 0.65 inch; breadth, 0.20 inch; divergence of slopes of spire about 19°.

“This shell has much the appearance of a slender *Nisso*, but it certainly wants the umbilicus seen in that genus, its axis not being in the slightest degree perforated. It is even like some recent species of *Euli-*

¹ Die Mollusken der Aachener Kreide, Palæontographica, Bd. 34, p. 129 et seq.

mella, and may possibly have to take the name *Eulimella funicula*, when its generic characters can be more clearly determined from the examination of good specimens. The best examples I have seen do not show the extreme apex of the spire, or very clearly the form of the aperture. So far as can be determined, however, its columnella does not seem to present the straightness seen in *Eulimella*. I know of no closely allied Cretaceous species.

“*Locality and position.*—Cretaceous at Coalville, Utah.”

Some specimens from the north fork of Virgin river were described by Dr. C. A. White, who afterward added the following note on the species:

“The examples described and illustrated by me (loc. cit.) were published before I had seen either Mr. Meek’s types or his drawings, having access only to his published descriptions. Subsequently comparison raises a doubt as to their specific identity, but they are evidently congeneric. My examples were more robust than Mr. Meek’s, with a wider apical angle. It is possible that neither of these forms should be referred to *Eulimella*, but they certainly agree more nearly with the characteristics of that genus than with any other, so far as they are yet known.”

Genus CHEMNITZIA d’Orbigny.

CHEMNITZIA? COALVILLENSIS Meek.

Pl. xxx, Figs. 10 and 11.

Turbonilla (*Chemnitzia*?) *coalvillensis* Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 505; White, 1879, idem for 1877, p. 305, Pl. 9, Figs. 5a and b.

Original description:

“Shell elongate-conical; volutions ten or eleven, moderately convex; last one not much produced below, rounded, or sometimes obscurely subangular around the middle; suture well defined; aperture rhombic-suboval, being angular above and apparently a little so below; inner lip slightly thickened, rather deeply arched, a little reflected, and closely appressed below; outer lip thin. Surface ornamented by rather strong, simple, regular, nearly or quite straight vertical ridges, crossed by regularly disposed revolving lines (about ten or eleven of the ridges and five or six of the revolving lines being seen on each volution of the spire), while only the revolving lines are continued below the middle of the body volution.

“Length of a large specimen, 1 inch; breadth, 0.40 inch; angle of spire, from 20° to 25°.

“None of the specimens of this species yet seen are quite perfectly preserved at the base of the aperture. Some of them look as if there had been a slight angularity there, while others, differing in no other respect, present appearances that leave room for doubt on this point. In some of its characters this shell reminds one of the fresh-water *Go-*

niobasis, to which I was at one time much inclined to refer it, and I am hardly quite sure yet that it may not have to take the name *Goniobasis coalvillensis*. Many authors refer very similar shells to *Chemnitzia*, but it has not so large and produced a body volution and aperture as the forms to which Mr. Conrad and Dr. Stoliczka propose to apply that name. If found in any of the Paleozoic rocks, most geologists would refer it to *Loxonema* of Phillips. Whether or not the nucleus or apex of its spire was covered as in the typical species of *Turbonilla*, I have been unable to determine. It is a far larger shell, however, than the species upon which that genus was founded.

"Specifically, this shell seems to be related to *Turbonilla spillmani* Conrad (Jour. Acad. Nat. Sci., vol. iv, new series, Pl. 46, Fig. 28), but its vertical folds or costæ are straighter, less crowded, and less numerous, while its revolving lines are smaller and more numerous. Its aperture also certainly differs in being decidedly more angular above, and probably somewhat so below. It may likewise be compared with *Scalardia mathewsonii* Gabb, from Cretaceous rocks of California, from which it differs in having less convex volutions, or less rounded aperture, less crowded vertical ridges, and more distinct and coarse revolving lines.

"*Locality and position.*—Coalville, Utah; from below the lowest heavy bed of coal at that locality. Cretaceous."

The figures of this species hitherto published do not give a correct idea of it, because the specimen drawn had lost nearly all of the shell and consequently the transverse costæ are less prominent and more broadly rounded than they should be. The examples figured on Pl. xxx are from the typical locality and certainly belong to Meek's species. They show the character of the ornamentation and the extremes of variation in form, but they do not give any additional information concerning the generic relationship of the shell.

Some fragmentary specimens that apparently belong to the same species were collected from shales in the "third ridge" of the Coalville section, about 1,500 feet above the bed in which the types were found.

CHEMNITZIA? sp.

Turbonilla (Chemnitzia) melanopsis (Con.?) White, 1876, U. S. Geog. and Geol. Sur. West 100th Merid., vol. iv, p. 197, Pl. 18, Fig. 10a.

Not *Turbonilla (Chemnitzia) melanopsis* Conrad, 1860, Jour. Acad. Nat. Sci., Phila., 2nd ser. vol. iv, p. 287, Pl. 46, Fig. 35.

The fragments figured by Dr. White and doubtfully referred to Conrad's species came from southern Utah. Other similar specimens have since been obtained from the coal-bearing series near the base of the upper Cretaceous in the same region, where it is associated with *Glaucania coalvillensis*, *Barbatia micronema*, and *Corbula nematophora*. They are too imperfect for specific description, but they are certainly distinct from *Turbonilla melanopsis*. The form is apparently rather short and

robust, and it is marked by strong transverse costæ. It resembles the *Goniobasis cleburni* White of the Bear River formation, excepting that it is not quite so slender.

APORRHAIIDÆ.

Genus APORRHAIIS Dillwyn.

APORRHAIIS (GONIOCHEILA) CASTORENSIS Whitfield.

Pl. XXXI, Fig. 1.

Aporrhais (Goniocheila) castorensis Whitfield, 1877, Prelim. Rept. Paleont. Black Hills, p. 38; 1880, Geol. Black Hills of Dakota, p. 427, Pl. 12, Fig. 1.

Original description:

“Shell small, with a moderately elevated spire, composed of about four flattened or very slightly ventricose volutions, which are crossed by fine, flexuous, vertical folds, strongly directed forward in their course across the whorl, and also marked by fine, thread-like, revolving lines; suture distinct; apical angle about 40° , but slightly variable on different individuals. Body volution proportionately large and very strongly angular, or even carinate, along the middle, flattened or slightly concave on the upper surface, and rapidly contracted below to the short, pointed, rostral beak. A second rather indistinct carination marks the surface a little below the first, but seldom or never extends to the margin of the lip. Outer lip expanded, strongly carinate on the back, and projecting in the middle to form a short, obtuse, slightly recurved digitation, and posteriorly extending along the spire to the base of the second volution above.

“This species somewhat resembles *A. biangulata* M. & H.,¹ but differs in the subdued character of the lower carination and in the strongly uniaangular form of the body volution. Among a number of specimens none show the posterior canal extending above the point described, nor any evidence of a second digitation to the lip. The surface markings are quite superficial, but few specimens showing them, appearing quite smooth from slight exfoliation.

“We are extremely adverse to describing new species of this group of shells, as from their extreme liability to variation with different degrees of development they are easily mistaken, and we have feared that this might prove, on the examination of a larger and better collection of specimens, to be only a form of *A. biangulata* M. and H., above referred to, but the single strong carination and the fact that it comes from a lower geological horizon and distant locality have induced us to separate it under a new name.

“*Formation and locality.*—In the ferruginous sandy limestone on the east fork of Beaver creek, Black hills. Associated with fossils of the Fort Benton group.”

¹ Paleontology of the United States Geological Survey of the Territories, p. 322, Pl. 19, Fig. 6.

APORRHAI (PERISSOPTERA?) PROLABIATA White (sp.)

Pl. XXXI, Fig. 2.

Anchura prolabiata White, 1876, Geol. Uinta Mts., p. 121.*Anchura* (*Drepanocheilus*) *prolabiata* White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 313, Pl. 7, Fig. 2a.Compare *Anchura?* *fusiformis* White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 190, Pl. 18, Fig. 4a.

The following is Dr. White's description, with a few changes and corrections made necessary by the better material now before me:

Shell rather above medium size, subfusiform, spire elongated and tapering to a point, with nearly straight sides; volutions nine or ten, convex, the last one proportionally a little more enlarged than the others, the distal margin of each narrowly appressed against the proximal side of the next preceding one at the suture; wing large, broad, its outer border, nearly straight or slightly convex, its anterior extremity abruptly rounded to the broadly concave front margin; posteriorly the wing is divided by a deep rounded sinus into two portions, the posterior of which is narrow and directed backward and a little outward in a slender pointed process, while the anterior portion is larger and subquadrate, with the outer angles slightly produced. Anterior canal and beak short; no posterior canal, though the outer lip is slightly produced backward and attached to the penultimate volution; inner lip and adjacent parts of the shell glazed, but without a distinctly marked callus.

Transverse costæ slightly curved, scarcely half as wide as the interspaces, usually well marked on the whole spire, and gradually increasing in prominence on each succeeding whorl until on the back of the body volution they become narrow elevated ridges that extend from the suture to about the middle of the whorl, but on a few specimens, such as the original type, the transverse ornamentation is less prominent throughout and almost obsolete on the body whorl, and it is always more or less indistinct for some distance around the inner lip. In addition to these regular costæ the spire sometimes bears a number of heavy varices that are not quite parallel with them. The entire surface is covered with crowded revolving raised lines that are barely visible without the aid of a lens. There is no carina on the body volution, but the posterior process of the wing is subcarinate, especially toward the extremity.

Length of the largest specimen, 47^{mm}; breadth, across the wing and body volution, 34^{mm}; diameter of the body volution, 18^{mm}.

No closely related species has been described from the American Cretaceous, though *Rostellaria rostrata* Morton, a Ripley species, should probably be referred to the same section. In the Cretaceous of Europe there are many similar forms, such as *Aporrhais parkinsoni*, *A. reussi*, *A. schlotheimi*, etc., ranging from the Gault to the lower Senonian, inclusive.

Some of the shells described by Dr. C. A. White as *Anchura? fusiformis* Meek, are certainly young individuals of *Anchura prolabiata*, but the figured specimen may represent a distinct species. The form of the wing seems to be different from that of *A. prolabiata* at any stage of its growth, but as none of the surface features are preserved it is impossible to determine its true relations. Prof. Meek stated that it does not belong to his species.¹ These specimens came from several localities in New Mexico and their associates at some of them at least belong to the Colorado formation. This species, together with the European species above mentioned, forms a natural group that differs considerably from typical species of *Anchura* in general aspect, and especially in the form of the wing. The subgenus (of *Aporrhais*) *Perissoptera* proposed by Mr. Tate² in 1865 was evidently intended to include this group. Unfortunately I have been unable to obtain the original paper, in which the subgenus was described, and consequently I do not know what species was taken as the type. According to Mr. Gardner³ it is equivalent to his section I of *Aporrhais*, and includes *A. parkinsoni* and related forms, and also the recent *A. occidentalis*. The latter species, which was the type of Gabb's subgenus *Arrhoges*, has many features in common with the Cretaceous forms, the principal difference being that it has a distinct thickened inner lip, but whether it is placed in the same section with the fossil forms or not I think that Tate's name should probably be applied to the latter, as he was writing on "the so-called Rostellariæ of the Cretaceous." More recently these forms have been referred to *Lispodesthes*, which I regard as an entirely distinct genus.⁴

Locality and position.—Sink spring and Upper Kanab valley, Utah, occurring about 350 feet above the base of the Cretaceous section at the latter locality.

Genus ANCHURA Conrad.

ANCHURA (DREPANOCHILUS) RUIDA White.

Pl. XXXI, Figs. 3 and 4.

Anchura ruida White, 1876, Geol. Uinta Mts., p. 120.

Anchura (Drepanocheilus) ruida White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 312, Pl. 7, Figs. 4a and b.

Revised description:

"Shell rather small; spire moderately elongate; volutions about seven, convex; suture impressed; wing moderately large, contorted, bearing at its extero-posterior corner a strong falciform process, the direction of which is nearly parallel with the axis of the shell; the outer

¹ U. S. Geol. Expl. 40th Parallel, vol. IV, p. 161.

² Quoted by Gabb: Am. Jour. Conch., vol. IV, 1868, p. 148.

³ Gardner, J. Starkie, on Cretaceous Aporrhaidæ: Geological Magazine, Dec. II, vol. II, 1875, p. 394.

⁴ See p. 146.

border of this process is slightly convex and continuous with the outer border of the body of the wing; the extero-anterior border of the wing abruptly rounded, from which to the very short beak the border is sinuous, almost sigmoid; posterior border of the wing deeply concave, its proximal half being slightly reflexed outward, as if for the passage of soft parts corresponding to those that in allied genera occupy a posterior canal, as the curved sinus adjacent to the columella doubtless gave passage to soft parts corresponding to those that in *Anchura* proper occupied the anterior canal or channel of the beak; inner lip provided with a distinct and moderately broad callus, which, in some cases at least, extends beyond the distal end of the aperture across the next volution, as seen by dorsal aspect of the shell; columella very slightly produced in front, and its apex flexed a little toward the dextral side of the shell. Volutions of the spire marked by many longitudinally oblique folds, which extend to the suture on the proximal side of the volutions, but not much beyond the middle on the distal side, and do not appear at all on either the body-volution or wing. The whole surface marked by fine revolving striæ, which are more distinct upon the last volution than elsewhere; last volution and wing also marked by a moderately strong carina, which terminates at the point of the falci-form process.

"Length, 16^{mm}; breadth across the body-volution, including the wing, 12^{mm}.

"This species agrees well with the subgeneric diagnosis of Meek for *Drepanocheilus*, and in many respects it resembles *A. (D.) americana* Evans and Shumard sp., but it differs from that shell in its large anterior sinus, the deep sinuosity of the anterior border of the wing, and the reflexion of a portion of the posterior margin of the wing."

Locality and position.—Upper Kanab valley, Utah, from same horizon as the preceding species.

STROMBIDÆ.

Genus LISPODESTHES White.

This name was proposed¹ to include two species, *Lispodesthes nuptialis* and *L. lingulifera*, now regarded as one.

It was characterized as follows:

"Shell fusiform; anterior canal straight or slightly curved, and more or less produced; posterior canal extending nearly or quite the whole length of the spire, from near the apex of which it may be a little deflected; aperture winged; wing rather large, bearing two processes; the posterior process spine-like or falciform; the anterior process either in the form of a lobe or tongue-shaped; inner lip and spire covered with callus."

To this description it should be added that in the adult the wing is

¹ U. S. Geog. and Geol. Sur. West 100th Merid., vol. IV, p. 191

greatly thickened and bordered externally by a raised rim; the anterior canal is bent inward (from the observer in the dorsal view); and in the known forms there is no transverse sculpture on the volutions of the spire. In fact, it agrees with *Pugnellus* in every particular excepting that it has a long posterior canal.

In Zittel's Handbuch der Paleontologie, *Lispodesthes* is adopted as a subgenus under *Aporrhais*, but he includes in it *Aporrhais reussi* and other related forms of the type of *Aporrhais* (*Perissoptera*?) *prolabiata*, above described, which, as it seems to me, is entirely distinct. Holzappel,¹ following Zittel, has used the name only for such forms as I now refer to *Perissoptera*. In outline there is some resemblance between species of *Perissoptera* and *Lispodesthes nuptialis*, but the differences in all other characters seem to me of much greater than specific importance.

I would place *Lispodesthes* in the Strombidæ next to *Pugnellus*.

LISPODESTHES NUPTIALIS White.

Pl. XXXI, Figs. 5 and 6.

Anchura nuptialis White, 1874, Expl. Sur. West 100th Meridian, Prelim. Rept. Invert. Foss., p. 24.

Lispodesthes nuptialis White, 1876, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. IV, p. 192, Pl. 18, Figs. 3a and b.

Lispodesthes lingulifera White, 1876, ibid., Pl. 18, Figs. 2a and b.

Revised description:

"Shell small; body subfusiform; wing moderately large; spire somewhat prominent, acute, but so thickly encrusted with callus that the volutions are only obscurely shown, except where the callus is removed by exfoliation; revolving angle absent or obsolete upon the volutions of the spire, even when bared by exfoliation of the callus, but it is somewhat distinct upon the body-volution, being continued out upon the falciform process of the wing. This posterior falciform process diverges widely from the axis of the shell, but by recurving it extends nearly as far backward as the apex of the spire; anterior process of the wing somewhat thickened, its breadth throughout about equal to that of the falciform process at the base, its length and breadth about equal, its outer end obliquely rounded; space between the two processes very narrow; from the base of the anterior process the border of the wing extends forward with a concave curve to the base of, and ends at, the long, slender anterior canal; posterior border of the wing concave and continuous with that of the falciform process on the one hand and with the callus-border of the posterior canal on the other.

"Length, from the apex of the spire to the end of the anterior canal, 20^{mm}; breadth, measuring across from the base of the processes of the

¹ Mollusken der Aachener Kreide, p. 120, Pl. XII, Figs. 11-13.

wing to the opposite side, 9^{mm}; spire, falciform process, and anterior canal each about 7^{mm}."

In the type specimen the wing is very thick and bordered externally by a raised rim and the anterior canal is somewhat curved inward. In these features, as well as the thick callus enveloping the spire, it resembles *Pugnellus*.

The types of *Lispodesthes lingulifera* were obtained at another locality though apparently from about the same horizon as the one above described. They are smaller specimens with thinner shells and wings of slightly different shape, but these differences are only such as might be seen at various stages in the growth of a single individual and are therefore not regarded as of specific importance. The author of the species concurs in this opinion.

It has already been shown in the note on the genus *Lispodesthes* that this typical species is not closely related to such forms as *Aporrhais parkinsoni*, *A. schlotheimi*, etc., that have been referred to this genus by Zittel and Holzapfel. The only species known to me that seems to be congeneric with this one is *Anchura? newberryi* Meek¹. The description and figure of this species, given by Whitfield in the Geology of the Black hills of Dakota, show that it belongs to the same section with *L. nuptialis*.

Locality and position.—Fifty miles north of Camp Apache, 5 miles west of Mineral Springs, Arizona; east of Mount Taylor, 1 mile south of Pajuate, New Mexico. At the former locality it is associated with *Camptonectes platessa* and at the latter with *Pinna petrina*, both of which occur elsewhere in the Colorado formation.

Genus PUGNELLUS Conrad.

PUGNELLUS FUSIFORMIS Meek (sp.).

Pl. XXXI, Figs. 7–11.

Anchura? fusiformis Meek, 1877, U. S. Geol. Expl. 40th Parallel, vol. iv, Pt. 1, p. 160, Pl. 15, Figs 2 and 2a.

Not *Anchura? fusiformis* (Meek) White, U. S. Geog. & Geol. Sur. West 100th Meridian, vol. iv, p. 190, Pl. 18, Fig. 4a.

Lispodesthes? obscurata White, 1880, Ann. Rept. U. S. Geol. Sur. Terr. for 1878, p. 30, Pl. 11, Figs. 7a and b.

Shell, exclusive of the outer lip, fusiform, consisting of six or seven volutions, of which the last forms about five-sixths of the total length; the whorls of the spire are sometimes subangular above the middle, and the body-whorl is ventricose in the same region; suture distinct in young shells, but almost entirely covered in the adult by a very heavy spiral callus, which extends backward from the inner lip over the

¹ Macomb's Exped. from Santa Fé to junction of Grand and Green rivers, p. 129.

apex of the spire; aperture narrow, oblong; outer lip in the adult greatly thickened and expanded, bordered externally by a heavy ridge. The posterior expansion of the outer lip is broad falciform, slightly narrowed at the base, somewhat twisted so that it is not quite in the same plane as the rest of the margin, directed backward and outward, and terminating in a blunt point. About midway between this falciform process and the anterior end of the canal there is a smaller subquadrate projection, directed downward and forward, in front of which there is a deep, narrow sinus, followed by a third projecting lobe that is broadly rounded and separated from the anterior end of the canal by a well-defined notch. The tip of the canal is slightly bent inward. The shell is very thin on the dorsum, which is the only portion not covered in the adult by a heavy callus. Surface smooth, excepting on the upper portion of the body-whorl, where it is marked by more or less prominent curved transverse costæ that are sometimes shortened into nodes. From the front end of the last costa a rather prominent subangular ridge, corresponding to the angulation of the earlier whorls, passes out on the outer lip and forms the upper (posterior) border of the falciform process. In the earlier stages of its growth the shell has a much more simple form.

Length of a large specimen, 41^{mm}; breadth, including the expanded outer lip, 39^{mm}; diameter of body-whorl, exclusive of lip, 16^{mm}.

This description is drawn from a large collection of well preserved specimens from Huerfano park, Colorado. At several localities the species is very abundant in a bed of sandstone, which I have, for that reason, called the Pugnellus sandstone, as a convenient local designation.

The original types of Meek's species are imperfect sandstone casts from the neighborhood of Coalville, Utah, while White's types, also imperfect and showing different features, came from the Arkansas river above Pueblo, Colorado. Better collections recently made at both these localities prove that they all belong to the species that is so abundant in Huerfano park, and that it has all the characteristic features of *Pugnellus*.

The most nearly related form is *Pugnellus manubriatus* Gabb, from the Chico series of California, but the resemblance is not so close as to require minute comparisons.

Locality and position.—At the localities mentioned in Colorado the species is confined to the upper part of the Fort Benton, being most abundant in the thin bed of Pugnellus sandstone, just beneath the Niobrara limestone, and very rare in the upper part of the underlying shales. At Coalville, Utah, it occurs in the sandstone of the "second ridge," where it is associated with many of the same species that are found with it in Colorado. It has also been found at the same horizon at Bear River city, Wyoming.

TRITONIIDÆ.

Genus TRITONIUM Link.

TRITONIUM KANABENSE n. sp.

Pl. XXXI, Fig. 12.

Shell small, slender, fusiform, with six or seven rounded whorls, of which the last is somewhat inflated and below abruptly contracted into the short canal. Surface ornamented by very prominent narrowly rounded transverse costæ, of which there are about ten on the last whorl, crossed by strong elevated revolving lines, alternating with faint lines on the later whorls. There are also a few strong varices on the spire, representing the outer lip at various stages of growth.

The canal is short and somewhat bent and the aperture is ovate in outline. The outer lip is strongly dentate within and the inner lip has a thin callus.

Length of the type specimen, which is incomplete at both extremities, 21^{mm}; greatest breadth, 10^{mm}.

Locality and position.—About 350 feet above the base of the Cretaceous section at Upper Kanab, Utah. Collected by Mr. C. D. Walcott.

FUSIDÆ.

Genus FUSUS Lamarck.

FUSUS SHUMARDI H. & M.

Pl. XXXI, Fig. 13.

Fusus shumardi Hall and Meek, 1856, Mem. Am. Acad. Arts. and Sci., vol. v, 2d ser., p. 391, Pl. 3, Fig. 6; Whitfield, 1880, Geol. Black Hills of Dakota, p. 424, Pl. 12, Figs. 7 and 8.

Whitfield's description is as follows:

"Shell small, with a moderately elevated spire and rather short rostral beak; volutions about six, strongly ventricose, and marked by comparatively strong, slightly oblique, vertical costæ or folds, which are directed forward on the lower part of the upper volutions and again recurved below, as seen on the body whorl, and also by finer striæ of growth between the folds. The folds are crossed by numerous elevated revolving lines, with wider interspaces; suture well marked and distinct; aperture obliquely ovate, obtusely pointed above, and continued below into the short, narrow, rostral canal; columellar lip slightly thickened, but without visible folds or plaits.

"The specimen used is imperfect at both extremities and much of the surface shell removed; enough remains, however, to furnish the specific characters. The species may possibly belong to Mr. Meek's genus

Trachytriton; but although the vertical folds are distinctly marked where the shell is entirely removed, there is no evidence of revolving lines on the spaces between them, as required in the diagnosis of that genus.

“*Formation and locality*.—In a ferruginous sandy limestone on the east fork of Beaver creek, Black hills, associated with fossils referred to the Fort Benton group.”

This species seems to have been abandoned by Prof. Meek, as he does not include it in his final work on the “Invertebrate Cretaceous and Tertiary Fossils of the Upper Missouri Country,” and he there speaks of it as a possible synonym of *Trachytriton vinculum*. The original type was found in the Fort Pierre group at the Great Bend of the Missouri. It is somewhat doubtful whether the specimen above described belongs to the same species. (See remarks on *Pleurotoma hitzi*, p. 161.)

FUSUS GABBI Meek.

Pl. XXXI, Fig. 14.

Fusus (*Neptunea*) *gabbi* Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 504; White, 1879, idem for 1877, p. 317, Pl. 9, Fig. 9a.

Original description:

“Shell rather small, fusiform; spire moderately prominent, conical; volutions seven or eight, convex; last one somewhat ventricose in the middle, and rather suddenly contracted below into the narrow, slightly twisted, more or less bent, and apparently moderately produced canal; suture well defined; aperture rhombic-subovate, and rather suddenly narrowed into the canal below. Surface ornamented with equal, distinct, regularly disposed varices or vertical folds, about eight of which may be counted on the penultimate volution, and less on the body-whorl, where some of them become obsolete; crossing these are also seen fine revolving lines, and a little below the suture, apparently a shallow revolving furrow that gives it a slightly banded appearance.

“Length, including canal, about 0.87 inch; breadth, 0.40 inch; slopes of spire straight, and diverging at an angle of about 50°.

“The specimens of this species contained in the collection are quite imperfect, being mainly casts retaining more or less of the shell. From such material it is, of course, impossible to determine with much confidence the generic affinities of shells. I have, therefore, provisionally referred it to the genus *Fusus*, putting in parenthesis the name *Neptunea* with a mark of doubt, to indicate that I suspect it may belong to that group, with the limits assigned it by some conchologists. It seems, however, quite as probable to belong to *Tritonidea*, as understood by some.

“*Locality and position*.—Coalville, Utah; from the Cretaceous beds below the lower heavy bed of coal mined at that place.”

FUSUS (NEPTUNEA?) VENENATUS n. sp.

Pl. XXXII, Figs. 1 and 2.

Shell fusiform, rather large; spire conical, equaling or exceeding the aperture and canal in length; volutions about six, convex, obliquely flattened above; last whorl abruptly contracted into the canal, which is not complete in any of the specimens, but was evidently rather short and bent to the left (in aperture view).

Surface with numerous thread-like revolving lines and a row of prominent rounded nodes, of which there are about twelve on each volution. In the shells with more elongate spires like the largest one figured, this row of nodes is near the middle of the whorls of the spire, while in those that are more depressed it is near the suture. The nodes are not conspicuous on the earlier whorls. Aperture, exclusive of canal, oval; inner lip with a moderately thick callus; outer lip unknown.

Length of largest specimen, exclusive of canal, 72^{mm}; breadth, 43^{mm}.

The collections from Huerfano park contain a large number of fragmentary specimens that I have placed in this species. They vary considerably in form, the extreme being shown by the two specimens figured. These two would hardly be regarded as belonging to the same species if it were not for the fact that other examples seem to be exactly intermediate between them.

In size and general appearance this species has some resemblance to *Fusus* (*Serrifusus*) *dakotensis* M. & H., but the volutions are not at all carinate, as in that species, and the form of the aperture is different.

Locality and position.—In the Pugnellus sandstone on Williams creek, in Poison canyon, and other localities in Huerfano park, Colorado.

Genus TRITONIDEA Swainson.

TRITONIDEA? HUERFANENSIS n. sp.

Pl. XXXI, Fig. 15.

Shell rather small, short fusiform, spire elevated, about equal in length to the aperture and canal; whorls six, ventricose, abruptly contracted just below the suture so that they have a shouldered appearance, with prominent rounded nodes on the shoulder of the body-whorl. On the spire these nodes are elongated into transverse costæ that completely cross the exposed portion of the whorl. Surface also marked by numerous flat revolving lines that are broader than the spaces between them. Aperture not seen.

Length of the type specimen, 23^{mm}; breadth, 14^{mm}.

In general appearance this species is not very different from some of the smaller individuals of *Fusus* (*Neptunea*?) *venenatus* with which it

is associated. It differs, however, in the shouldered character of the whorls as well as in all the details of surface ornamentation.

Locality and position.—Poison canyon, Huerfano county, Colorado, in the Pugnellus sandstone.

Genus FASCIOLARIA Lamarck.

FASCIOLARIA? WALCOTTI n. sp.

Pl. XXXII, Fig. 5.

Shell small, slender fusiform, consisting of eight or nine convex whorls; spire elevated, about equal in length to the last volution; last whorl merging into the rather short and slightly curved canal. Surface marked by numerous sinuous transverse costæ and finer, closely arranged, revolving lines. On the penultimate whorl there are about thirty of the costæ and about twenty revolving lines.

Length, 29^{mm}; breadth, 10^{mm}.

The single type specimen is beautifully preserved, but as it is imbedded in a hard matrix from which it can not be removed without endangering it, I have not been able to see the character of the aperture nor to determine whether there are any folds on the columella. It seems, however, to be closely related to *Fasciolaria* (*Mesorhytis*) *gracilentia* Meek, from which it differs in its shorter canal, more numerous transverse costæ, and more delicate sculpture.

Locality and position.—Collected by Mr. C. D. Walcott about 350 feet above the base of the Cretaceous section at Upper Kanab, southern Utah.

FASCIOLARIA? (CRYPTORHYTIS) UTAHENSIS Meek (sp.)

Pl. XXXII, Figs. 3 and 4.

Fusus (*Neptunea*) *utahensis* Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 505.

Fusus? *utahensis* White, 1880, idem for 1878, p. 34, Pl. 12, Fig. 2a.

Original description:

“Shell of moderate size, short fusiform; spire rather depressed, conical; volutions about four; those of the spire a little convex; last one large and ventricose, rounded or very slightly flattened around the middle and contracted rather rapidly below into a narrow canal that is longer than the spire, and more or less bent to the left; aperture rhombic, angular above and narrowed and prolonged into the canal below. Surface, as determined from a cast in sandstone, with obscure vertical ridges, about twelve of which may be counted on the penultimate volution, while on the last, or body-whorl, they become nearly or quite obsolete. (Revolving lines probably also marked the surface of the shell, though no traces of anything of the kind are seen on the cast, excepting a shallow furrow above the suture on the volutions of the spire.)

"Length, including canal, about 1.90 inches; breadth, 0.91 inch; angle of spire, about 67° ."

In the collections from Huerfano park, Colorado, there are a number of specimens that are believed to belong to this species although in the type and other examples from Coalville, Utah, only the general form and a part of the surface features are preserved. The Colorado specimens show the following additional characters: The surface ornamentation consists of lines of growth and rather distant rounded transverse costæ which never entirely cross the whorls of the spire and in many individuals are shortened into obtuse nodes, or become obsolete, especially on the last whorl. In some cases these nodes are almost concealed by the succeeding whorl thus leaving the spire nearly smooth and giving an undulated outline to the sutures which are not very distinctly impressed and are sometimes glazed over by a deposit of callus. Some examples also show faint revolving lines. The outer lip is simple and sharp, and the inner lip has a thin deposit of callus which seems to have spread over the spire in the adult. The columella bears below the middle one very prominent fold that is hardly visible in the aperture view of a perfect specimen. The angle of the spire varies considerably as is shown by the figures, and the number of volutions is six or seven instead of four.

I am very much in doubt as to the generic relations of this species, and the material at hand is not sufficient to show all of its characters fully. It seems, however, to be allied to *Fasciolaria*? (*Cryptorhytis*) *flexicostata* M. & H. It is one of those early generalized forms that seem to stand between the Fasciolariidæ and the Volutidæ though this species is more closely related to the latter family.

Locality and position.—In the "second ridge" at Coalville, Utah, and with similar associates in the Pugnellus sandstone, Poison canyon, Huerfano park, Colorado.

Genus PYROPSIS Conrad.

PYROPSIS COLORADOENSIS n. sp.

Pl. XXXII, Figs. 6-8.

Shell of rather large size, pyriform, consisting of four or five rapidly increasing volutions; spire in some specimens much depressed, in others rather prominent; suture distinct, bordered below by a revolving ridge that gives it a channeled appearance; whorls bicarinate around the middle, the upper carina the stronger, obliquely flattened above and rather abruptly contracted below into the canal, which is moderately long and slightly curved. On the whorls of the spire only the upper slope above the greater carina is exposed. In addition to the carinæ, that are prominent and more or less nodose on the body whorl,

the surface ornamentation consists of numerous strong, granular revolving lines, usually alternating with finer ones and crossed by distinct lines of growth. Aperture elongate ovate, suddenly narrowed and slightly produced above to form a short posterior canal and more gradually contracted below into the rather broad anterior canal.

Outer lip thin and slightly dentate within; inner lip comparatively thin, forming a broad thin glaze on the body whorl above, but thickening and narrowing below until it is free from the columella, leaving a distinct and deep umbilicus. There is a single oblique fold on the columella.

Length of one of the types, 77^{mm}; greatest breadth, 49^{mm}.

Compared with *Pyropsis bairdi* M. & H., which seems to be the most closely related described form, this species has a shorter and broader anterior canal, a larger umbilicus, only two carinæ on the body whorl instead of three, and stronger revolving sculpture. Besides, our species has the short posterior canal and the dentate outer lip, both of which are entirely lacking in *P. bairdi*. In some respects it approaches *Rapa cancellata* Sowerby, from the Cretaceous of southern India.

Locality and position.—In the Pugnellus sandstone on Williams creek and in Poison canyon, Huerfano park, Colorado. Some very imperfect casts from about the same horizon at Coalville, Utah, probably belong to this species.

VOLUTIDÆ.

Genus ROSTELLITES Conrad.

This genus was proposed in 1855 with *Rostellites texana* (= *Volutithes navarroensis* Shumard) as the type. In 1876 Gabb gave the name *Volutoderma* to the group to which this species belongs. In his recent discussion of the Volutidæ Dr. W. H. Dall¹ has more fully characterized the genus and restored Conrad's earlier name. His description is as follows: "The genus *Rostellites* is characterized by a usually thick shell with a tendency to cancellated sculpture of distant narrow ridges, more or less nodose at the intersections; by an acute apex and trochoid, minute nucleus; by a tendency to a notch or sulcus in the outer lip near the suture; and by the presence of several well-differentiated plaits on the pillar. A few species are thin and the form is extremely variable. The surface is not glazed, the pillar is nearly straight, and the incremental lines are conspicuous."

Dr. Dall has kindly examined the three species described below and he regards all of them as members of this genus. *Rostellites gracilis* differs from the type of the genus in that the revolving sculpture is obsolete and the spire is glazed, at least in some examples, but these features are not considered of generic importance.

¹ Trans. Wagner Free Inst. of Sci., vol. 3, 1890, pp. 71, 72.

ROSTELLITES DALLI n. sp.

Pl. XXXIII, Figs. 11-13.

Shell of medium size, slender fusiform; spire elevated but not quite equal to the aperture in length; volutions about seven, convex, with a narrow constriction below the suture; body whorl large and in some specimens rather ventricose. Surface ornamented by distinct revolving lines and prominent rounded, transverse costæ, the latter dying out above the middle of the body whorl. On the last volution there are ten transverse costæ and about twenty revolving lines. Aperture long and narrow, with a slight notch at the posterior end as indicated by the lines of growth; outer lip lirate within; inner lip with a thin deposit of callus. Pillar nearly straight, with three distinct oblique folds near the middle, the anterior fold being the stronger. The folds are scarcely visible in the aperture view of an unbroken specimen.

Length of a medium sized specimen, about 80 mm; greatest breadth, 25 mm. Other specimens are considerably broader in proportion to their length.

The apex is not preserved in any of the specimens so that the character of the nucleus has not been determined.

This species seems to be congeneric with *Rostellites texanus* Conrad, which is the type of the genus to which Gabb subsequently gave the name *Volutoderma*. Specifically it is closely related to *Voluta* (*Rostellites*) *elongata* d'Orb., which occurs in the Turonian of France, the Gosau beds of Austria, and the Arriallor and Trichinopoly groups of southern India.

Internal casts are not easily distinguished from the following species with which it is associated, but the surface ornamentation is very different.

Localities and position.—In the Pugnellus sandstone at many localities in Huerfano park, and at a slightly lower horizon on the Arkansas river, 20 miles above Pueblo, Colorado.

ROSTELLITES AMBIGUA n. sp.

Pl. XXXIII, Figs. 8-10.

Shell of rather large size, spindle shaped; spire elevated and rather slender, somewhat more than half the length of the aperture; whorls about seven in number, moderately convex, the last one very large; suture distinct, more or less channeled. Below the rounded border of the suture the whorl is slightly constricted or flattened. Surface ornamented by numerous closely arranged revolving lines and by larger curved transverse costæ that are less conspicuous on the body whorl than on the spire, and that have a tendency to form nodes just below the suture.

The aperture is narrow, prolonged into the rather short canal, and with a short posterior notch. Outer lip thin, obscurely lirate within,

and slightly reflexed; inner lip with a very thin callus. The pillar is slightly arched with two distinct folds, the anterior of which is the stronger, and faint indications of two others behind them.

Length of an average specimen, 77^{mm}; greatest breadth, 24^{mm}. Other specimens show that the species attained a considerably greater size and sometimes had a more robust form.

One imperfect specimen of which a figure is given (Pl. XXXIII, Fig. 10) differs somewhat in the character of the ornamentation, the transverse costæ being shortened into rounded nodes. Possibly it belongs to a different species; but the other specimens that certainly belong together show considerable variation in this character.

Forms similar to this have been referred to *Fasciolaria* by Stoliczka and others, but they seem to belong to the Volutidæ. It is true, however, that in the Cretaceous the lines can not be sharply drawn between the Volutidæ and the Fasciolariidæ; and we find different authors assigning such forms in some cases to *Fasciolaria* and in others to *Volutilithes* and other volutoid genera. Some forms of *Piestochilus* which was proposed as a subgenus under *Fasciolaria* by Meek are not very different in general aspect from this species.

Locality and position.—Abundant in the Pugnellus sandstone on Williams creek and in Poison canyon; it also occurs at other places in Huerfano park, and at about the same horizon at Rattlesnake butte, 18 miles east of Walsenburg and on the Arkansas river, 20 miles above Pueblo, Colorado.

ROSTELLITES GRACILIS n. sp.

Pl. XXXIV, Figs. 1-3.

Shell large, slender, fusiform, consisting of about seven volutions, the last of which comprises about three-fourths of the total length of the shell; whorls convex and rounded in the middle, constricted posteriorly, the body whorl gradually narrowed into the moderately long canal; suture linear, appressed, in some examples apparently glazed by a thin deposit of callus. Surface marked by rather distinct lines of growth and by curved transverse costæ that cross only the convex portion of the whorl leaving the posterior constricted portion smooth. The costæ are most prominent on the upper part of the spire, gradually becoming more distant and less conspicuous and disappearing entirely on the last whorl or sometimes earlier. One specimen also shows traces of numerous very fine revolving lines on the earlier whorls.

Aperture long and narrow, posteriorly acute and slightly emarginate; outer lip thin, sharp, and smooth within; inner lip with a thin deposit of callus that seems sometimes to spread over the spire in a thinner glaze. Pillar nearly straight with three very strong, subequal, oblique plaits near the middle.

Length of a medium-sized specimen, 110^{mm}; greatest breadth, 28^{mm}. The largest of the figured specimens, which lacks the apex of the spire

and the entire canal, measures, without restoration, 109^{mm} in length and 49^{mm} in breadth. This large specimen differs somewhat in form from the others and it is the one that shows fine revolving striæ on the earlier whorls of the spire. If better collections should prove that two species are represented the name here proposed should be used for forms like that represented by Figs. 1 and 2 of Pl. XXXIV.

I do not know any described species nearly related to this one and its generic affinities are not very clear. In general form and in the character of the plaits of the columella it is quite like *Rostellites*. In other respects it suggests *Volutomorpha*, and perhaps it should be regarded as intermediate between these two groups.

Locality and position.—In the Pugnellus sandstone near Malachite and in Poison canyon, Huerfano park, Colorado. About a dozen more or less fragmentary specimens were obtained.

CANCELLARIIDÆ.

Genus CANCELLARIA Lamarck.

CANCELLARIA MALACHITENSIS n. sp.

Pl. XXXIII, Figs. 6 and 7.

Shell small, short fusiform, comparatively thick; spire moderately elevated, conical, consisting of three or four whorls; body whorl very large, rounded, produced below into a short, broad canal. Surface beautifully cancellated by strong revolving and transverse lines. On the body volution there are about fifteen of the revolving lines of which two or three nearest the suture are considerably larger than the others and separated by broader furrows. On the spire only four revolving lines are visible.

The aperture is not complete in any of the specimens, but it is evidently narrow ovate in outline, and the columella bears three strong plaits, of which the first and second are very close together, and the posterior one is more remote and the strongest.

Length of one of the larger specimens, 18^{mm}; breadth, 9^{mm}.

Locality and position.—In the Pugnellus sandstone near Malachite, Huerfano park, Colorado; represented by three specimens.

Genus ADMETOPSIS Meek.

ADMETOPSIS RHOMBOIDES Meek.

Pl. XXXIII, Fig. 3.

Admete? rhomboides Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 501.

Admete? gregaria Meek, 1873, *ibid.*

Admetopsis rhomboides White, 1879, *idem* for 1877, p. 317, Pl. ix, Figs. 6a and b.

Original description:

“Shell rather small, rhombic-suboval, or short subfusiform, the length being slightly more than twice the breadth at the widest part, which is

near the middle; spire rather depressed-conical, subturreted; volutions five or six, convex; last one forming about three-fourths the entire bulk of the shell, and more than half of its length, widest near its upper part, and abruptly narrowed below so as to present an obliquely obovate form; suture rather deep from the convexity of the volutions; aperture narrow, subangular above and narrowed below to a small notch at the base of the truncated columella, which is provided with two small obscure plaits or folds, the lower of which is formed by the twisted margin of the truncated inner lip, while the other is placed a little farther up; outer lip sharp, with its margin slightly retreating above, and more prominent below, or near the middle. Surface ornamented by distinct vertical folds, that are usually well developed on the volutions of the spire, and around the upper part of the body whorl, but become obsolete below; moderately distinct revolving lines also mark the lower part of the body volution, but these appear to become obsolete on its upper part, and on those of the spire, as specimens are usually found.

“Length, 0.37 inch; breadth, 0.21 inch; angle of spire about 58° .”

The three forms to which Prof. Meek gave the names *Admete? rhomboides*, *A.? gregaria* and *A.? subfusiformis*, at the same time suggesting *Admetopsis* as a generic designation for them, are very abundant in certain layers near the base of the Cretaceous section at Coalville, Utah, where the types were obtained. The surface markings of these fossils are seldom well preserved and most of the examples are more or less crushed and distorted. Prof. Meek states that the ornamentation is similar and variable in all the species, and his chief reason for separating them seems to have been that some individuals are much more slender than others. Dr. White remarks concerning them (loc. cit.) that “after examining many examples I am much inclined to think that they represent not more than two species at most.” It seems to me probable that there is only one variable species, but for the present and until better collections shall fully decide the question, I shall refer the short ventricose specimens to *Admetopsis rhomboides*, and the slender elongate ones to *A. subfusiformis*, treating *A. gregaria* as a synonym of the former as Dr. White has already done.

ADMETOPSIS SUBFUSIFORMIS Meek.

Pl. XXXIII, Figs. 1 and 2.

Admete? subfusiformis Meek, 1873, Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 502.

Admetopsis subfusiformis White, 1879, idem for 1877, p. 318, Pl. IX, Fig. 7.

?*Admetopsis gregaria* White, ibid., Pl. III, Fig. 5a, and U. S. Geog. and Geol. Sur. West of 100th Merid., vol. IV, p. 198, Pl. XVIII, Figs. 5a, b.

Original description:

“Shell subfusiform, with the length nearly three times the breadth; spire elongated, conical, turreted; volutions seven or eight, convex;

last turn more than half the entire length; suture well defined in consequence of the convexity of the whorls; aperture narrow, equaling about two-fifths the entire length of the shell, angular behind and narrowing below to a small, sharply defined notch at the base of the truncated columella, which seems to bear two small folds near its lower part, one being formed by the twisted and truncated lower margin; inner lip a little thickened; surface ornamented by distinct, regular vertical folds that are nearly or quite obsolete on the body-volution below its upper part, and regular revolving lines quite well defined on the body-turn, especially its lower part, and appear to be obsolete on those of the spire; lines of growth moderately distinct.

“Length, 0.50 inch; breadth, 0.20 inch; angle of spire, about 30°.

“This species differs even more strongly from the last [*A. gregaria*] than that form does from the species *rhomboides*, having a much more elevated spire and a proportionally smaller body-volution and aperture. In ornamentation, however, the three forms are much alike. The species here under consideration shows a somewhat more thickened inner lip than I have yet seen in either of the others.”

The fossils from southern Utah that have been referred to *Admetopsis gregaria* (see last two references above) seem to belong here, if the more slender elongate form can be regarded as a specific character.

Locality and position.—Near the base of the Cretaceous section at Coalville, Utah, and at several localities in southern Utah.

ADMETOPSIS HUMEROSA n. sp.

Pl. XXXIII, Figs. 4 and 5.

Shell small, slender, fusiform; whorls about eight, the earlier ones rounded and marked by numerous distinct transverse costæ, the last two or three distinctly shouldered and smooth. The transverse ornamentation is proportionately strongest near the apex of the spire, and is gradually reduced as the whorls become shouldered or channeled, until it disappears entirely on the body whorl, and usually on the preceding one. Some specimens show very faint revolving lines.

Aperture showing the characteristic features of the genus as in the other described species. Inner lip considerably thickened; outer lip not complete in any of the specimens.

Length of an average specimen, 15^{mm}; breadth, 8^{mm}.

This species may be easily distinguished by the shouldered character and smooth aspect of the larger whorls.

Locality and position.—Near Iron city, southwestern Utah, where it is associated with *Glaucania coalvillensis*, *Barbatia micronema*, *Corbula nematophora*, and other species of the Colorado formation. About 40 specimens were collected.

PLEUROTOMIDÆ.

Genus PLEUROTOMA Lamarck.

PLEUROTOMA? HITZI Meek.

Pl. XXXIV, Fig. 4.

Turris (Surcula)? hitzi Meek, U. S. Geol. Sur. Terr., vol. ix, p. 386, Fig. 50 in text. Compare *Fusus shumardi* (H. & M.) Whitfield, 1880, Geol. Black Hills of Dakota, p. 424, Pl. 12, Figs. 7 and 8.

“Shell elongate-conical (or fusiform), thin; spire much produced and turreted; volutions about seven, distinctly convex, or subangular around the middle, and flattened or concave with an outward slope above the angle, and convex below; last one not larger than the regular enlargement of the others from the apex, each provided with about thirteen prominences or little obscure vertical folds, which on the angle of the last turn assume rather more the character of obscure nodes; entire surface marked by raised, revolving lines; aperture trigonoid-oval, being biangular above and abruptly contracted below; beak, if any existed, unknown.

“Length (exclusive of the beak), about 2 inches; breadth, 0.90 inch; slopes of spire somewhat convex, and diverging at an angle of about 36°.”

The only example of this species known to me is the imperfect type specimen, which does not show either the generic or the specific characters very well.

The small fossil described by Whitfield (loc. cit.) and referred by him to *Fusus shumardi* has fully as close resemblance to the earlier whorls of this species as it has to *Fusus shumardi*, and the fact that it comes from the Fort Benton group, the same horizon from which *Turris hitzi* was obtained, while *Fusus shumardi* came from a higher horizon, makes its identification with the former species more probable.

Locality and position.—On the Missouri river opposite Fort Shea, where it is associated with fossils of the Colorado formation.

ACTÆONIDÆ.

Genus ACTÆON Montfort.

ACTÆON PROPINQUUS n. sp.

Pl. XXXIV, Figs. 5–8.

Shell small, slender ovate, with six convex volutions; spire moderately elevated, acute; suture impressed or slightly channeled. Surface marked by fine, punctate, revolving lines, of which there are about six visible on each whorl of the spire and about twenty on the body whorl. The aperture is narrow, acute behind and narrowly rounded in front. There is one prominent fold on the columella.

Length of the larger specimen, 10^{mm}; breadth, 5^{mm}.

This species is closely related to *Actæon subellipticus* M. & H., which occurs in the Fort Pierre shales of Dakota. It has a larger number of whorls and fewer revolving striæ, the form of the aperture is slightly different, and the body volution is more ventricose.

Locality and position.—In the Pugnellus sandstone, Poison canyon, Huerfano park, Colorado, represented by three specimens.

BULLIDÆ.

Genus HAMINEA Leach.

HAMINEA TRUNCATA n. sp.

Pl. XXXIV, Figs. 9-11.

Shell rather large, thin, subcylindrical; whorls two and a half or three, the last one very large and gradually expanding to the anterior end, where it is squarely truncate; spire depressed, not projecting above the last whorl; sutures channeled. Surface smooth and polished, with faint wrinkles and lines of growth and very obscure traces of revolving striæ. Possibly the thin outer layer of shell bearing the revolving striæ has been exfoliated. The aperture is subtriangular, being narrow and acute behind and very broad in front. The outer lip is free from the preceding whorl for some distance, leaving a moderately deep narrow slit, below which it is almost straight to the front, where it is abruptly rounded into the straight anterior border.

Length of the largest specimen, 23^{mm}; greatest breadth, 18^{mm}.

The depressed spire, the smooth surface, and the square-cut anterior end are the distinctive features of this species by which it may be separated from all the described Cretaceous forms known to me, though a number of recent species resemble it more closely in these respects.

Locality and position.—In the Pugnellus sandstone, Poison canyon, Huerfano park, Colorado. Represented by three specimens.

AURICULIDÆ.

Genus MELAMPUS Montfort.

MELAMPUS? ———?

Melampus? ———? White, 1880, Ann. Rept. U. S. Geol. Sur. Terr. for 1878, p. 25, Pl. 19, Fig. 6a; 1883, 3d Ann. Rept. U. S. Geol. Sur., p. 444, Pl. 5, Fig. 17.

This species, which has never been described or named on account of lack of sufficient material, was found in the lowest fossiliferous beds of the Cretaceous section at Coalville, Utah. Only one specimen has yet been found.

LIMNÆIDÆ.

Genus PHYSA Draparnaud.

PHYSA sp.?

Physa ———? White, 1879, Ann. Rept. U. S. Geol. Sur. Terr. for 1877, p. 307, Pl. 7, Fig. 13a; 1883, 3d Ann. Rept. U. S. Geol. Sur., p. 444, Pl. 4, Fig. 5.

A single specimen of *Physa*, too imperfect for specific description, was found by Dr. C. A. White in the "second ridge" at Coalville, Utah, where it was associated with many marine species of the Colorado formation. It is the only example of the genus that has been found in that formation.

CEPHALOPODA.

NAUTILOIDEA.

NAUTILIDÆ.

Genus NAUTILUS Breynius.

NAUTILUS ELEGANS Sowerby.

Pl. XXXV, Fig. 1.

Nautilus elegans Sowerby, 1816, Min. Conch., vol. II, p. 33, Pl. 116; Sharpe, 1853, Monog. Chalk Cephal. of England, p. 12, Pl. 3, and many other European authors.

Nautilus elegans var. *nebrascensis* Meek and Hayden, 1862, Proc. Acad. Nat. Sci., Phila., p. 25.

Nautilus elegans Meek, 1876, U. S. Geol. Sur. Terr., Vol. IX, p. 499, Pl. 8, Figs. 2, a, b, c. Compare *Nautilus texanus* Shumard, 1860, Trans. St. Louis Acad. Sci., vol. I, p. 590.

Meek's description is as follows:

"Shell subglobose, broadly rounded over the periphery and on each side of the umbilicus, which is closed in young and medium-sized specimens, but becomes a little open in the adults; volutions increasing rapidly in size, considerably wider transversely than in the dorso-ventral direction, all of those within entirely embraced and hidden by the last one; aperture transversely reniform-sublunate, being profoundly sinuous on the inner side for the reception of the inner turns; margins of the septa arching forward a little near the umbilicus, slightly waved backward on the sides, then again curving very slightly forward as they approach the periphery, in crossing which they bend again almost imperceptibly backward; siphuncle placed a little outside of the middle of the septa; surface of the outer volution ornamented by regular flattened, transverse costæ (about five times as broad as the narrow, shallow grooves between) and moderately distinct lines of growth, which, like the costæ, in crossing the periphery, arch gracefully and deeply backward, parallel to the deep peripheral sinus of the margin of the lip.

"Length or greatest diameter, about 3.90 inches; height, 2.82 inches; breadth at aperture, 3.40 inches."

Locality and position.—Chippewa point on the upper Missouri river, in Fort Benton shales.

AMMONOIDEA.

LYTOCERATIDÆ.

Genus HELICOCERAS d'Orbigny.

HELICOCERAS PARIENSE White.

Pl. XXXV, Figs. 2-4.

Helicoceras parienne White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 203, Pl. 19, Figs. 2a-d.

Compare *Ancylceras annulatus* Shumard, 1860, Trans. St. Louis Acad. Sci., vol. I, p. 595.

Original description:

"Shell dextral; spire much depressed; whorls distinct, subcircular or very broadly oval in transverse section, increasing somewhat rapidly in size; surface marked by comparatively strong, rather abruptly rounded annulations, which cross the whorls obliquely; annulations only slightly prominent upon the inner side of the whorls, but more prominent upon the upper and under sides; upon the outer side of the whorl each annulation bears a pair of prominent nodes, one on each side of the siphuncle, forming two dorsal rows of nodes along the whole length of the shell, the portion of the annulation between each pair of nodes being straightened and slightly flattened upon the back. The annulations are apparently always simple, never coalescing, and never failing to completely encircle the volution. The nodes are moderately prominent upon exfoliated specimens, and where the test is preserved they are seen to be subspinous or sharply nodose.

"Septa moderately distant, sometimes embracing two annulations, but toward the aperture only one. Lobes all smaller than the saddles, the size in each transverse series gradually diminishing from the dorsal to the ventral one; the smallest saddle, the ventral, not being larger than the largest lobe, the dorsal; lobes all bifurcate, except the ventral, the inferior lateral lobe being but slightly so; the anterior portion of the space between the branches of the dorsal lobe occupied by two backward projecting points; the ventral lobe is simple, small, narrow, and serrate upon both sides. The saddles of the different longitudinal series all similar in shape, diminishing gradually in size from the dorsal to the ventral series; all broader than long, except the ventral one, the length and breadth of which are about equal; each partially parted at the middle; edges of all the lobes and saddles serrated or toothed.

The longest fragment in the collection measures about 7^{cm}. At the

larger end of this the long diameter is 15^{mm} and the short diameter 14^{mm}; at the smaller end the long diameter is 8½^{mm}.

"This species is similar in aspect to *H. Mortoni* Hall and Meek, but differs from it in diminishing in caliber much more rapidly toward the apex, in the presence of a double series of nodes along the dorsum of the volutions, and in the proportions and details of its lobes and saddles.

"*Position and locality.*—Cretaceous strata; southeast of Paria, Utah."

In the collection from Upper Kanab, Utah, there are many fragments of this species, some of which show the form of the spiral at least in the earlier stages. One of these showing one and a half volutions is figured. The form is not constant, however, as one specimen is more closely coiled than this one, while others form a more open spiral and show a tendency to become straight at an early stage. The spire is only very slightly elevated, so that in side view the apex is almost concealed by the succeeding larger whorl.

The nodes on the periphery vary considerably in different examples. In some cases they are not developed on the earlier whorls, while other fragments of the same size bear two rows of sharp spines.

Excepting in its more depressed spire this species is very much like *Helicoceras annulatum* d'Orb., which is the type of the genus. Similar forms have frequently been referred to *Crioceras*, *Hamites*, *Ancyloceras*, and other so-called genera that are based entirely on slight differences in form.

The species described by Shumard without figures under the name *Ancyloceras annulatus* seems to be closely related to this Utah form and may be identical with it.

HELICOCERAS? CORRUGATUM n. sp.

Pl. XXXV, Fig. 5.

Shell dextral, forming a very low, broad, open spiral; whorls with an ovate cross section, increasing rapidly in size, apparently not in contact. Surface marked by small, regular, rather closely arranged costæ that pass obliquely entirely around the whorl. The costæ are narrowly rounded, not quite as broad as the interspaces and without nodes or spines.

Full form of the shell and details of the septa not known.

The type specimen, which is about half of one volution, measures 105^{mm} in length, with sections 10 by 12^{mm} at the smaller end and 18 by 23^{mm} at the larger end.

If the earlier whorls continue the low spiral indicated by the form of this fragment and by the oblique direction of its costæ it must have been almost as much depressed as *Helicoceras pariense*, though in such evolute forms it is never safe to restore the entire shell from a single fragment.

Specifically this shell is easily distinguished from *H. pariense* by its

more numerous and smaller costæ without nodes, and by its larger size.

Locality and position.—From the lower part of the Niobrara limestone on Turkey creek, Huerfano park, Colorado, where it is associated with *Buchiceras swallovi*, *Baculites gracilis*? and *Inoceramus fragilis*.

Genus BACULITES Lamarck.

BACULITES GRACILIS Shumard?

Pl. XXXVI, Figs. 1-3.

Baculites gracilis Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 596.

Baculites ovatus (Say) White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 199, Pl. 19, Figs. 4b and c.

Shell small, very slender; transverse section varying from broad ovate to subelliptical; surface sometimes nearly smooth, but usually with numerous distinct rounded costæ or undulations that are strongest on the siphonal side from which they curve backward parallel with the lines of growth, gradually becoming fainter and disappearing before reaching the opposite side. In addition to the costæ there are broad, rather obscure constrictions at intervals of about half an inch that completely encircle the shell. They are also more distinct on the siphonal side and are parallel with the lines of growth, passing nearly straight across the siphonal and antisiphonal sides and curved sharply backward on the flank.

Septum with six lobes and six saddles, all of the latter, excepting the antisiphonal one, symmetrically but not deeply divided; lobes much more slender than the saddles.

Length of the longest fragment in the collection, 106^{mm}, diameters of the extremities, 10^{mm} by 7½^{mm} and 5^{mm} by 4^{mm}, respectively.

This species differs from *Baculites ovatus* in its smaller size and more slender form, in the character of the surface ornamentation, and the details of the septa. The latter have the same general character in the two species, but on comparing specimens of the same size it is seen that in *B. gracilis* the septa are more distant and not so deeply incised and the lobes are narrower in proportion to breadth of the saddles.

The fossils above described include the specimens from southeast of Paria, Utah, that were doubtfully referred to *B. ovatus* by Dr. White (loc. cit.), a larger collection from Upper Kanab, Utah, where it is associated with many species of the Colorado formation about 350 feet above the base of the Cretaceous section, and several examples from the Niobrara limestone on Turkey creek, Huerfano park, Colorado.

Shumard's types were found on Shawnee creek, Grayson county, Texas, in strata that are believed to be approximately the equivalent of the Colorado formation. The species was not figured and I have never seen any Texas examples of it. Consequently the identification

of the western specimens is somewhat doubtful, though they agree fairly well with the original description. Shumard states that the septum of his species has only four lobes, but it is evident from the detailed description that he counted the lateral lobes on only one side, so that there are really six.

In form and surface ornamentation this species resembles *Baculites baculoides* d'Orb., but the periodic constrictions on that species are narrower and more distinct and the septa are much more complex.

BACULITES ASPER Morton?

Pl. XXXVI, Figs. 4 and 5.

Baculites asper Morton, 1834, Synopsis Org. Rem. Cret. Gr., p. 43, Pl. 1, Figs. 12 and 13, Pl. 13, Fig. 2.

In the collection from Cinnabar mountain, Montana, there is a number of fragments of a small *Baculites* that are provisionally referred to this species. They were first mentioned by Prof. F. B. Meek.¹ They are associated with fossils of the Colorado formation. Recently Mr. W. H. Weed has collected specimens of the same form on Mission creek, northern Montana, associated with *Pholadomya papyracea* and *Inoceramus undabundus*, both of which are Colorado fossils.

The form is slender, very gradually tapering, rather narrow ovate in cross section, and bearing on each side a row of distant more or less prominent tubercles. The tubercles are usually rounded, but sometimes they are slightly elongated, taking a crescentic form.

The diameters of the largest specimen are 14^{mm} and 11^{mm}. Nearly all of the fragments are more compressed than this one.

The septa are not deeply divided, and are characterized by the great breadth of the saddles as compared with the lobes, but they are not well enough preserved to show all the details.

Mr. Gabb considered this species identical with *B. anceps* Lamarck,² but most other authors have regarded them as distinct. The type of *B. asper* came from Cahawba, Alabama, but its exact stratigraphic range in that region is not yet known. A form that is certainly identical with the one from Montana occurs in the Austin limestone of Texas and was referred to Morton's species by Dr. Roemer.³ The material now at my disposal does not permit me to determine whether the same form occurs at a higher horizon or not. The one in the Montana and Ripley formations that is usually referred to *B. anceps* seems to me certainly distinct from this one, and the fragments that Prof. Meek doubtfully referred to *B. asper*⁴ are probably also different.

¹ Ann. Rept. U. S. Geol. Sur. Terr. for 1872, p. 475.

² Proc. Acad. Nat. Sci. Phila., 1861, p. 395.

³ Kreideb. v. Texas, p. 36.

⁴ U. S. Geol. Sur. Terr., Vol. IX, p. 404, Pl. 39, Fig. 10.

Baculites incurvatus Dujardin as figured by Schlüter¹ is a closely related form, that occurs in the "Emscher Mergel" of Germany. Several of its associates are considered identical with forms that are found in the Austin limestone and in the upper part of the Colorado formation.

AMALTHEIDÆ.

Genus BUCHICERAS Hyatt.

BUCHICERAS SWALLOVI Shumard (sp.).

Pl. XXXVII, Fig. 1; Pl. XXXVIII, Figs. 1-3.

Ammonites swallowi Shumard, 1860, Trans. St. Louis Acad. Sci., vol. 1, p. 591.

Buchiceras swallowi White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 202, Pl. XX, Figs. 1a, b, c.

Compare *Placenticeras* (*perizianum* ? var.) *liardense* Whiteaves, 1889, Cont. to Can. Paleont., vol. 1, pt. 2, p. 158, Pl. XX, Figs. 1 and 2.

Dr. White's description of the Utah fossils referred to this species is as follows:

"Shell moderately large, flattened-discoid; sides greatly convex; dorsum [abdomen] narrowly flattened, the flattened space bordered on each side by a row of more or less distinct nodes; volutions three or four, partially embracing; umbilicus broad, its outline not clearly defined; deep for so discoid a shell, although it has a shallow aspect because of its breadth and want of definite outline, and exhibiting a large part of each of the inner volutions; aperture subovate in outline, its longest diameter directed from the center of the shell, narrowest at the outer end, where it is truncated by the flattening of the dorsum [abdomen]; sides of the volutions marked by prominent, somewhat flexuous, rounded costæ, extending from the inner to the outer edge; the space between each two of these principal costæ is occupied by one or two short ones which do not reach the umbilicus, but they end at the dorsum [abdomen] like the others; upon each costa, near its dorsal [abdominal] end, there is an obtuse node, which, together with the dorsal [abdominal] nodes before mentioned, constitute a double row of nodes at each side of the dorsum [abdomen]. Saddles all broader, and simpler in outline than the lobes, none of the former being really digitate, and those near the ventral side of the volutions are nearly as simple in outline as they are in *Ceratites*.

"This shell presents some differences from the description by Dr. Shumard of *A. swallowi*, the principal of which is the absence of the nodes at the umbilical side of the volutions and of the distinct transverse ribs of the dorsum [abdomen] mentioned by him; but these are not regarded as essential specific characters.

¹ Palæontographica, Vol. XXIV, Pl. 39, Figs. 6 and 7.

“Full diameter of the shell, about 18^{cm}; transverse diameter of the aperture, nearly 5½^{cm}; long diameter of the same, about 8½^{cm}.

“Prof. Hyatt writes me, after an examination of the specimen figured on Pl. XX, that he regards it as a species of his genus *Buchiceras*, but that, ‘it differs from *B. syriacum*, the type of the genus, in having larger lobes and cells more Ammonite-like.’

“*Position and locality*.—Strata of the Cretaceous period; Glendale, Long valley, Utah.”

The types of the species came from “4½ miles north of Sherman, and bluffs of Red river in Fannin and Lamar counties, Texas.” I have found a few fragments of it in the Niobrara limestone on Turkey creek, Huerfano park, Colorado. Mr. Walcott collected a number of specimens at Upper Kanab, Utah, about 350 feet above the base of the Cretaceous section. These show a considerable variation and some of them have nodes around the umbilicus and the costæ cross the abdomen, as in Shumard’s type. Direct comparison of the Utah fossils with specimens from Texas shows that they are unquestionably identical. Other specimens that are smoother and have a narrower umbilicus, look exactly like the figure of *Placenticeras* (*perizianum* ? var.) *liardense* Whiteaves, which occurs in the “Earlier Cretaceous” of British Columbia.

Genus PLACENTICERAS Meek.

PLACENTICERAS PLACENTA Dekay (sp.)?

Pl. XXXIX, Figs. 1-3.

Ammonites placenta Dekay, 1828, Ann. N. Y. Lyceum Nat. Hist., vol. II, p. 278, Pl. 5, Fig. 2, and of various authors.

Ammonites (*Placenticeras*) *placenta* Meek, 1870, Proc. Am. Philos. Soc., vol. XI, p. 429, and Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 297.

Placenticeras placenta Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 465.

Meek’s description is as follows:

“Shell lenticular in form, attaining a large size; umbilicus small; volutions deeply embracing, compressed laterally, with sides converging from near the umbilicus to the periphery, which is very narrowly truncated and flattened or a little concave, with its smooth margins becoming more obtuse with age; aperture narrowly sagittate; surface generally smooth or only showing very obscure traces of curved, transversely-elongated prominences on each side, with sometimes a row of very small indistinct nodes around the umbilicus; in young, exfoliated shells also usually showing small, faintly defined, divaricating corrugations, directed backward around the outer half of each side.

“Large examples attain 2 feet or more in their greatest diameter. Young specimens, 3.70 inches in breadth, show a thickness of about 0.90 inch, while large individuals are proportionally thicker, and on the periphery become more obtuse.

"Septa with 12 lateral lobes and as many sinuses on each side, in large examples crowded and very complex." [The detailed description of the septa is omitted, as it is more clearly expressed by the figure.]

The species has hitherto been regarded as characteristic of the Montana formation and its equivalents, and I have been in doubt whether the specimens from the earlier beds should be referred to the same species, but the scanty material at hand does not show enough difference to permit of separation. Whether they are placed in a different species or not, I have no doubt that they were the direct ancestors of the form that is so abundant and well developed in the overlying formation.

The collection under examination consists of single fragments from Huerfano park and Rattlesnake butte, Colorado, and Coalville, Utah, and several more or less fragmentary specimens from Upper Kanab valley, Utah. None of these indicate a size of more than 8 or 10 inches in diameter. The only differences that have been observed between these and typical examples of the species is that the septa are somewhat less complicated and less crowded, and the periphery seems to have become rounded in somewhat smaller specimens, but the species is known to vary in these respects. A specimen from Ellis county, Texas, where it is associated with *Buchiceras swallowi*, probably in the Eagle Ford shales, is still more closely like the typical form.

In the collection from Upper Kanab some examples are smooth, while others, such as the small specimens figured, show a tendency to become nodose, like the variety *intercalare*. The septum figured was visible only to the edge of the umbilicus, so that several of the small inner lobes and sinuses are not shown.

Genus PRIONOCYCLUS Meek.

This generic name was first suggested by Prof. Meek¹ in 1871, but he then gave no diagnosis, and he did not again use the name in his writings until 1876, when he published² a description of the genus and of the two subgenera, *Prionocyclus* (typical) and *Prionotropis*, with *P. wyomingensis* as the type of the former, and *P. woolgari* of the latter. In the same work the genus *Mortoniceras* was proposed with *Ammonites vespertinus* (= *A. texanus*) as the type. Meanwhile Neumayr had proposed³ the name *Schloenbachia* for the "very natural group of the Cristati," in which he evidently included forms that are referable to *Prionocyclus* and *Mortoniceras*, if not to *Prionotropis*, and in Zittel's Handbuch der Paleontologie these three names are treated as synonyms of *Schloenbachia*. They certainly have some features in common, the septa, especially, being similar in all our American species.

¹ Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 298.

² U. S. Geol. Sur. Terr., vol. ix, pp. 452, 453.

³ Deutsch. geol. Gesellsch., Zeitschr., Bd. xxvii, 1875, p. 887.

Some representatives of *Prionocyclus* and *Prionotropis*, including the types, were submitted to Prof. Alpheus Hyatt, and after examining them he states that they are generically distinct and that he also regards both as separate from *Schloenbachia* properly restricted. I shall therefore use Prof. Meek's names.

As to the genus *Mortoniceras*, the specimens from the Colorado formation are hardly sufficient for generic determination and the original description will be simply copied under the old names.

PRIONOCYCLUS WYOMINGENSIS Meek.

Pl. XL, Figs. 1-4.

Ammonites serratocarinatus Meek, 1871, Proc. Am. Philos. Soc., vol. XI, p. 429.

Ammonites (*Pleuroceras*?) *serratocarinatus* Meek, 1871, Ann. Rept. U. S. Geol. Sur. Terr. for 1870, p. 298.

Prionocyclus wyomingensis Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 452; White, 1880, Ann. Rept. U. S. Geol. Sur. Terr. for 1878, p. 35, Pl. 15, Figs. 1a-e; Whitfield, 1880, Geol. Black Hills of Dak., p. 440, Pl. 14, Figs. 1-3.

Not *Ammonites serratocarinatus* Stoliczka, 1865, Cret. Cephalopoda of Southern India, p. 57, Pl. 32, Fig. 3.

Original description:

"Shell attaining a rather large size; discoid, with periphery provided with a very narrow, prominent, serrated mesial keel, including the siphuncle. Volutions increasing rather gradually in size, somewhat compressed laterally, and a little excavated without being distinctly channeled on each side of the ventral keel; inner ones but slightly embraced by each succeeding turn, and consequently well exposed in the wide umbilicus. Surface ornamented with numerous unequal costæ, some of the larger of which bear a small, somewhat elongated node near the umbilicus, and two closely approximated small nodes around the ventro-lateral margins, where they all curve very strongly forward as they pass upon the periphery; spaces between each two of the large nodose costæ occupied by from one to about three smaller ones. Septa unknown."

The costæ are very irregular and vary considerably in strength on different individuals, but they retain the same character through all the stages of growth, excepting that the smaller intermediate ones almost disappear from the last whorl of very large specimens. Frequently two costæ spring from a single node near the umbilicus and sometimes are again united in the node near the periphery, but in other cases they continue separate until they disappear near the keel. Very few specimens show more than one row of nodes near the periphery, and these are never developed into spines. The serrations of the keel are small and somewhat more numerous than the costæ.

The septum, as shown in the figure, has the same general character as that of *Prionotropis woolgari*, the principal difference being in the greater breadth of the first lateral lobe.

The breadth of the whorls is about two-thirds of the height in young specimens; in larger ones it is proportionally somewhat greater.

The species sometimes reached a size not less than 25^{cm} in diameter. The outer whorl of a specimen that is 125^{mm} in diameter measures 38^{mm} in width by 48 in height.

Ammonites germari Reuss, which occurs in the Turonian of Germany, seems to be a closely-related species.

Locality and position.—The types came from the valley of the Medicine Bow river, Wyoming; Whitfield's specimens were found "in siliceo-calcareous layers of Division No. 2, Cretaceous, on the east fork of Beaver creek, near Camp Jenney, Black hills." It is common but usually not well preserved in a layer of calcareous sandstone immediately beneath the Niobrara limestone in Huerfano park and other places in southern Colorado and along the eastern base of the Front range, and it occurs in eastern Utah.

PRIONOCYCLUS MACOMBI Meek.

Pl. XLI, Figs. 1-5.

Prionocyclus? macombi Meek, 1876, Macomb's Exploring Exped. from Santa Fé, N. M., to the Junction of Grand & Green Rivers, Geol. Rept., p. 132, Pl. 2, Figs. 3a-d.

Original description:

"Shell discoidal; umbilicus shallow; somewhat less than the diameter of the last whorl from the ventral to the peripheral side, and showing all the inner turns; volutions increasing gradually in size, very slightly embracing, compressed so as to be nearly flat on the sides, but rounding into the umbilicus; periphery rather narrow, nearly flat, and provided with a small mesial carina, which is very slightly waved in outline; lateral margins of the periphery each having a row of small compressed nodes, arranged one at the termination of each of the costæ, with their long diameters nearly parallel to the peripheral keel; sides of each turn ornamented by from thirty-six to forty rather obscure, slightly flexuous costæ, only every second, third, or fourth one of which extends across to the umbilical margin, where they are usually a little swollen.

"The septa are generally a little crowded in adult shells, and divided into two very unequal principal lobes on each side. Siphonal lobe slightly longer than wide, and ornamented by three branches on each side, the two terminal of which are a little larger and much less spreading than the lateral pair, and each ornamented by some five or six sharp digitations along the margins and at the extremity, while the first pair of principal lateral branches above the terminal ones are of nearly the same form as the latter, but more spreading, and the third pair are smaller and merely provided with a few digitations; first lateral sinus (dorsal saddle of old nomenclature) as long as the siphonal

lobe, but much wider, and deeply divided into two unequal parts, of which the one on the siphonal side is larger than the other, each of these principal divisions being ornamented by some four or five short, irregular branchlets, with obtusely digitate margins; first lateral lobe longer and slightly wider than the siphonal, and provided with some seven or eight short, rather unequal, merely digitate, and palmately spreading terminal and lateral branchlets; second lateral sinus narrower, but as long as the first on the outer or siphonal side, and much shorter on the umbilical, having two short, unequal, digitate, terminal branches at the end, and some three or four short, irregular divisions along the oblique margin of the umbilical side; second lateral lobe small, or scarcely more than twice as large as the auxiliary lobe of the siphonal sinus, and somewhat irregularly bifid, the divisions being short, and, like the lateral margins, more or less digitate.

“Greatest diameter of a specimen retaining only a small portion of the non-septate outer whorl, 4.40 inches; greatest convexity of same, 0.95 inch; breadth of umbilicus, 1.35 inches; breadth of the last whorl from the siphonal to the umbilical side, 1.80 inches.”

The description of the septum above given was made out from a weathered specimen that did not show all the details clearly. The one I have figured is drawn from a smaller specimen, and it is therefore not quite so deeply divided as the one originally figured. There are also slight differences in the forms of the second lateral lobe and the second saddle, but these are in part due to errors in restoring the septum of the type. It will be seen by the figure now given that the septum is very similar to those of the other species of *Prionocyclus* above described.

In the young stages of this species the costæ are simple, linear, closely arranged, and strongly curved forward. The keel is then minutely crenate, with one crenation for each costa. After the third volution some of the costæ are more strongly developed and bear nodes or small spines at their outer ends while the intermediate ones become obsolete. The crenations of the keel still continue numerous and small.

One of the specimens figured (Fig. 2) has unusually strong spines around the periphery and the larger costæ are farther apart than in the other specimens of the same size.

This species is more closely related to *Prionocyclus wyomingensis* than to any other described American species. It can be easily distinguished by its more compressed form, by the greater regularity of the costæ, and by the much greater difference between its young and adult stages.

Locality and position.—The types came from “Banks of Canadian; lower part of Middle Cretaceous of New Mexican section.” I have collected it near Mancos, southwestern Colorado, about 400 feet above the base of the Colorado Cretaceous shales, where it is associated with *Ostrea lugubris* and *Inoceramus dimidius*.

Genus PRIONOTROPIS Meek.

PRIONOTROPIS WOOLGARI Mantell (sp.).

Pl. XLII, Figs. 1-4.

Ammonites woolgari Mantell, 1822, Geol. of Sussex, p. 197, Pl. 22, Figs. 6 and 7; Sowerby, 1829, Min. Conch., VI, p. 25, Pl. 587, Fig. 1; Sharpe, 1853, Fossil Remains Moll. Chalk of England, p. 27, Pl. 2, Figs. 1 and 2, and various other European authors; Meek and Hayden, 1861, Proc. Acad. Nat. Sci. Phila., p. 421.

Prionocyclus (Prionotropis) woolgari Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 455, Pl. 7, Figs. 1a-h and Pl. 6, Fig. 2.

Not *Ammonites woolgari* d'Orb. Paleont. Franç. Terr. Crét., vol. I, Pl. 108, Figs. 1-3.

Ammonites percarinatus, Hall and Meek, 1856, Mem. Am. Acad. Arts and Sci., 2d ser., vol. V, p. 396, Pl. 4, Fig. 2.

Compare *A. bravaisianus* and *A. carolinus* d'Orb., op. cit., Pl. 91.

Meek's description is as follows:

"Shell attaining a medium size, more or less compressed-discoidal, the outer turn being proportionally more convex (including nodes) than those within; umbilicus about equaling the greatest dorso-ventral diameter of the last turn; each volution embracing about one-fifth of the next within, and having its umbilical margin slightly indented by the uncovered nodes forming the inner of the two outer rows on the succeeding volution within. Young examples, half an inch to one inch in diameter, with costæ linear, closely arranged, of nearly uniform size, and manifesting scarcely any tendency to develop nodes, but already showing the forward curve of their outer ends well defined, while the peripheral keel is low, narrow, and simple, and the furrow on each side shallow. At a somewhat larger size, costæ usually more or less unequal in size, the larger ones now beginning to develop the two nodes at their outer curved ends, and to become a little more prominent and compressed at their inner extremities, while the rather more prominent keel begins to develop its crenate outline, and the nodes nearest it to assume their compressed form and parallel arrangement. On attaining to 2½ to 3 inches in diameter, costæ, nodes, and keel becoming more prominent, the latter being strongly compressed and deeply and largely scalloped, with divisions rounded in outline; while at this stage of growth, the periphery, as seen in profile, would seem to be very deeply sulcated on each side of the keel, but this is due to the prominence of the row of nodes on either side of the same. Costæ, when the shell has attained a diameter of 4 inches, much depressed in the middle, with the nodes at their inner ends thicker and more obtuse, and those nearest the keel more depressed or nearly obsolete, while those of the third series, near by, become much enlarged and produced obliquely outward as short, thick, spine-like projections. Soon the outer compressed nodes disappear, and the keel is only represented by distinctly separated, low, elongated nodes; and when the shell has attained a diameter of 7 inches, the costæ are more distant, greatly elevated, compressed, and almost wing-like, but still retain a large, prominent, sub-

trigonal node or projection at their outer ends, and again become, as it were, pinched up at their inner extremities, which do not quite reach the umbilical margin.

“Septa moderately close together; siphonal lobe longer than wide, with three or four short branches on each side, the two terminal of which are largest, more or less nearly parallel, and merely serrated; first lateral sinus broader than the siphonal lobe, more or less deeply divided into two subequal branches with short, irregular branchlets and digitations; first lateral lobe somewhat longer than the siphonal and tripartite, with short, irregular branchlets and digitations occasionally in small specimens, with the middle terminal branch proportionally broad and so deeply sinuous at the end as to impart more nearly the appearance of a bipartite arrangement of the whole; second lateral sinus nearly resembling one of the divisions of the first, and in the adult with merely a number of marginal digitations; second lateral lobe little more than one-third as long, and from one-third to one-half as wide as the first, generally tripartite at the end, but sometimes, in large specimens, bipartite on one side of the shell (see Fig. 1*h* of our Pl. 7), the divisions being very short and simple, or serrated; third lateral sinus very small and merely bilobate, or in large specimens digitate along the margins; third lateral lobe hardly half as long as the second, and in small specimens (it has not been seen in the large ones) merely tridentate at the end.

“Largest specimen seen (with a part of the nonseptate portion wanting), 7 inches in its greatest diameter; convexity, measuring between the costæ at the larger broken end of the last turn, 1.60 inches; convexity of the same, measuring so as to include the greatly expanded costæ, 3.25 inches.”

This species was fully illustrated by Prof. Meek (loc. cit.) and copies of several of his figures showing some of the stages of development are here given. So far as can be determined from the figures and descriptions of Mantell's types there is no reason for separating the American from the English forms, but those figured under the same name by d'Orbigny are entirely different, and it seems to me that the forms referred to *Ammonites woolgari* by Schlüter¹ probably also belong to another species. *Ammonites bravaisianus* and *A. carolinus* are probably immature specimens of *P. woolgari*, as Prof. Meek suggested. At least they can be exactly duplicated by young individuals of the American species. If these really are distinct from Mantell's species I think that our species is also different, but this can not be decided until the young stages of the English form are more fully known, and all the evidence now available supports the opinion that they are identical.

There has been some confusion in regard to the generic relationships of this species. Meek² made it the type of *Prionotropis*, which he

¹ Schlüter, C., Cephalop. d. oberen deutsch, Kreide, Palæontographica, vol. XXI, Pls. 9 and 12.

² Op. cit., p. 453.

regarded as a subgenus of *Prionocyclus*. When Neumayr described the genus *Acanthoceras*, he cited *A. woolgari*¹ as an example of that genus, but in the same paper he referred *A. bravaisianus*, which may be the young of the same species to *Schloenbachia*, a genus that as originally defined included *Prionocyclus* and *Mortoniceras*. In Zittel's *Handbuch der Paleontologie* the same inconsistency is repeated, as *A. woolgari* is listed under *Acanthoceras*, while both *Prionotropis* and *Prionocyclus* are treated as synonyms of *Schloenbachia*. On this point in a personal letter to the writer, Prof. Alpheus Hyatt says: "The type of this genus [*Acanthoceras*] was in my opinion the *Amm. angulicostatus* d'Orb. If this be granted, *Prionotropis* must be considered as the type of another genus, since no one having the latest views with regard to the Ammonitinæ would be apt to place it in the same group with *Acanth. angulicostatum* unless unacquainted with the history of the development of the individual in both of these types." Prof. Hyatt regards *Prionotropis* as generically distinct from *Schloenbachia* and *Prionocyclus* also, although it seems to me to have much closer affinities with the latter genus than with *Acanthoceras*.

Locality and position.—Southeast base of the Black hills, South Dakota, and on the Missouri river 5 miles below the mouth of Vermilion river in the Fort Benton shales. It is also reported from the same horizon in northeastern Nebraska, in New Mexico, and 8 miles north of Fort Lyon, Colorado, and from the Eagle Ford shales in Texas.

In Europe the species seems to be confined to the Turonian.

PRIONOTROPIS HYATTI n sp.

Pl. XLII, Figs. 5-8.

Compare *Ammonites meekianus* Shumard, 1860, Trans. St. Louis Acad. of Sci., vol. I, p. 592, and *Ammonites graysonensis* Shumard, *ibid.*, p. 593.

Shell of rather small size, compressed discoidal, consisting of five or six whorls; volutions gradually increasing in size, embracing the earlier ones but very slightly so that the umbilicus is broad, though different specimens vary somewhat in this respect. In very young examples the height of the whorls is greater than the breadth, the keel is small, and more or less crenate, and the costæ are simple, linear, and strongly curved forward at the outer ends, without any nodes at first. Usually every third or fourth costa is stronger than the others. Some specimens three-fourths of an inch in diameter are scarcely distinguishable from the young of *Prionotropis woolgari* excepting that usually the costæ are slightly more unequal. As the shell continues to grow the inequality of the costæ becomes more marked and each of the larger ones develops two nodes near the outer end where it curves forward, and on some of them there is also an elongated node near the umbilicus.

¹ Deutsch. Geol. Gesell. Zeitschr., vol. XXVII, 1875, p. 929.

At first the two outer nodes are equal, one being just on the angle between the side and the abdomen and the other about halfway between it and the keel, but at a later stage the nodes nearest the keel become obsolete, while the others rapidly increase in size, and some of them are developed into prominent sharp spines that are directed obliquely outward and backward. On the outer whorl of the larger example the costæ becomes distant, apparently by the suppression of the intermediate smaller ones.

While these changes in the surface ornamentation are developing, the form of the volution is also considerably altered. The abdomen becomes flattened on each side of the narrow, prominent keel, the sides become less convex, and the breadth of the whorl is finally almost equal to the height, so that its cross section is subquadrate.

The keel in all the larger specimens is usually more or less serrate, the serration equaling the costæ, though sometimes it is only slightly sinuous and it is never completely divided into nodes as it is in *Prionotropis woolgari*. Septa very much like those of *Prionotropis woolgari*, as is shown by the figures.

None of the specimens show the complete living chamber, but the well-developed spines and other features of the surface ornamentation seem to be adult characteristics, and it is therefore probable that the species never attained a very large size. The largest one before me measures 47^{mm} in diameter; the outer whorl is 16^{mm} in height, exclusive of the keel, and 15^{mm} in breadth. Some of the spines on specimens of this size are 6^{mm} or 7^{mm} long. Some fragments apparently of this species belonged to larger individuals.

The development of this species is very much like that of *P. woolgari*, but at the same time it shows many of the features of *Prionocyclus wyomingensis*.

Ammonites meekianus was described from fragments of the outer volution of a specimen that seems to have had about the same form as our species, but it was much larger than any of the examples I have seen. The description of the septum shows that it had the same general form as in *P. hyatti*, but the abdominal lobe is said to be broader than the first lateral, while the opposite is true in ours. The species has never been figured, and there are no specimens of it in the National collection.

I have not seen *Amm. graysonensis*, but judging from the description and a figure of one of the types it might be founded on the young of either this species or *P. woolgari*. The types of these two species came from near Sherman, Texas, in beds probably equivalent with the Fort Benton.

Locality and position.—Abundant in the Pugnellus sandstone at many localities in Huerfano park, Colorado, where the types were obtained. A few specimens were found associated with the same fauna in the "first and second ridges" of the section at Coalville, Utah.

PRIONOTROPIS? LÆVIANUS White (sp.).

Pl. XLIII, Figs. 3 and 4.

Ammonites lævianus White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. IV, p. 201, Pl. 19, Figs. 1a and b.

Original description:

"Shell moderately large, robust; volutions four or more, increasing rapidly in size, especially the outer one, so that the umbilicus is rather deep but yet showing all the volutions, each volution embracing between one-quarter and one-third of the width of each preceding one; transverse section of outer volution, between the nodes, oval-subquadrate; surface, upon each side, marked by a row of moderately elevated, transversely elongate nodes, situated about one-third of the distance from the umbilicus to the dorsum [abdomen]; and also by a row of very prominent nodes on each side of the dorsum [abdomen]. Each of these rows consists of the same number of nodes. The dorsal [abdominal] nodes diverge strongly, but are wholly embraced by each succeeding volution, and do not therefore appear in the umbilicus. Between these two rows of dorsal [abdominal] nodes, the dorsum [abdomen] is slightly convex, and the outer surface of the shell appears to have been marked by a small median carina. Between these nodes and the umbilicus the sides of the volution are broadly convex.

"A greater transverse elongation of the lateral nodes than exists on our example would make each continuous with its corresponding dorsal node, which would give to each lateral pair of nodes the character of a rib. It is not improbable that this modification may be found to exist in some examples of the species.

"Septa complex; dorsal [abdominal] lobe and part of dorsal [abdominal] saddle unknown; superior lateral lobe moderately large, but not bifid; inferior lateral lobe small, narrow, not bifid; accessory lobes and saddles more or less deeply notched or dentate.

"Diameter of the only example in the collections, the larger part of the outer chamber being broken away, 14 centimeters.

"Specific name given in honor of Dr. Oscar Løew.

"*Position and locality.*—Strata of the Cretaceous period; Ojo de los Cuervas, New Mexico."

The type specimen is the only one known that can be positively referred to this species. It is considerably weather-worn on the abdomen, so that the abdominal lobe of the septum is destroyed, and it is impossible to say whether the shell had a keel or not. The character of the ornamentation and of the septum, so far as it is preserved, suggests relationship with *Prionotropis woolgari* and it is provisionally referred to the same genus. It is considerably more involute than the species just mentioned.

Ammonites nodosoides, as figured by Schlüter,¹ resembles this species

¹Palæontographica, vol. XXI, p. 19, Pl. 8.

closely. Both it and *Ammonites woolgari* have been referred to *Acanthoceras* by some authors, while other species that seem to me related to it, such as *Amm. michelinianus* and *Amm. regularis* have been assigned to *Hoplites*.

P. lævianus is included in the fauna of the Colorado formation because no *Ammonites* of the same type are known in higher strata and because fragments that are believed to belong to this species have been found in the Fort Benton shales of Colorado.

Genus MORTONICERAS Meek.

MORTONICERAS SHOSHONENSE Meek.

Pl. XLIII, Figs. 1 and 2.

Mortoniceras shoshonense Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 449, Pl. 6, Figs. 3a, c and 6b.

“Shell compressed-discoidal, with umbilicus apparently nearly or quite twice as wide as the outer whorl; volutions very narrow, with dorso-ventral and transverse diameters equal, and section subquadrangular, those within scarcely one-sixth embraced by the succeeding turn; costæ each mainly represented by two nodes, the inner of which is low, compressed, and elongated so as to extend from near the umbilical margin about halfway across the sides, while the outer near the peripheral margin are more prominent, rounded, and directed laterally; keel less prominent than the row of compressed nodes on each side about halfway between it and the rounded nodes along the margins of the periphery; compressed nodes on the periphery of each inner turn covered by the succeeding volution, the inner margin of which is indented by the rounded lateral nodes of that next within.

“Septa moderately approximate; siphonal lobe oblong, about once and a half as long as wide, with small, short, nearly parallel, serrated terminal branches, and three or four very short, digitate, and simple branchlets and points on each side; first lateral sinus wider than the siphonal lobe (which it equals in length), unequally bipartite at the anterior end, both divisions being digitate, and the larger one on the siphonal side deeply bifid; first lateral lobe somewhat longer, but narrower than the siphonal, and having its terminal division deeply bifid, and its lateral margins bearing a few very nearly simple branchlets; second lateral sinus scarcely more than half as wide as the first, and much shorter on the umbilical side, unequally bifid or trifid at the end, with more or less sinuous margins; second lateral lobe only about half as long and wide as the first, and trilobate, with the small middle division emarginate at the end; third lateral sinus a little shorter and narrower, and irregularly tridentate at the end; antisiphonal lobe about as long as the first lateral, but narrower, with a few short, nearly simple, lateral divisions, and a tridentate posterior extremity.

"Having only a fragment of this species, no measurements of the size and proportions of the shell can be given. As this fragment shows the form and ornamentation, however, of the volutions, and very clearly all of the details of the septa, there will probably be no difficulty in identifying it. At one time I was rather inclined to regard it as a variety of *M. vespertinum* Morton; but as the costæ in that species seem to be very constant in the possession of four nodes each, while on the form here described each rib is represented by two nodes, and these of different forms, I can not believe it the same species.

"*Locality and position.*—Head of Wind river valley, Wyoming; from the Fort Benton group of the upper Missouri river Cretaceous series."

It is not improbable that this species, and possibly *M. vermilionense* also, is identical with *Amm. vespertinus* Morton (= *Amm. texanus* Roem.), as Meek suggested, but until other collections are made from the upper Missouri localities I prefer to leave them under separate names, giving copies of Meek's descriptions.

MORTONICERAS VERMILIONENSE M. & H.

Pl. XLIV, Fig. 1.

Ammonites vermilionensis Meek and Hayden, 1860, Proc. Acad. Nat. Sci. Phila., p. 77.
Mortoniceras vermilionense Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 450, Pl. 7, Fig. 2a, b.

"Shell compressed-discoid, with its shallow umbilicus about one-fifth wider than the last turn; volutions increasing gradually in size, with convexity about three-fourths the dorso-ventral diameter, each turn less than one-fifth embraced by the succeeding outer one; costæ simple and closely arranged in the very young shell, but gradually becoming larger, more distant, and a little thickened at their inner and outer extremities, which latter are slightly curved forward, in examples an inch or so in diameter; peripheral keel moderately prominent, with the depression on each side shallow.

"Septa not crowded; siphonal lobe oblong, about one-fourth longer than wide, with two short, narrow, equal or subequal, nearly simple lateral branches, the two terminal of which are diverging and moderately distant; first lateral sinus as long and nearly twice as wide as the siphonal lobe, and deeply divided into two nearly or quite equal parts, with merely sinuous and obtuse digitate margins; first lateral lobe slightly longer than the siphonal, and of about the same breadth, with some five or six spreading, unequal digitations at the posterior end, the middle two of which sometimes become more prominent, so as to give a slightly bifid appearance to the extremity; second lateral sinus short, or scarcely more than half as long on the inner side as the first, subquadrate in form, with shallow marginal sinuosities; the mesial very shallow indentation, causing a faint tendency to a bilobate outline at the anterior extremity; second lobe very small, or even less than the auxiliary lobe of the first lateral sinus, about twice as long as

wide, narrower, and truncated at its posterior end, with a very few shallow sinuosities along its lateral margins; third lateral sinus hardly half as long or wide as the second, and merely faintly bilobate at the end; third lateral lobe a little oblique, simple, and smaller than one of the principal terminal digitations of the first lateral lobe.

“Greatest diameter, 1.10 inches; convexity, about 0.26 inch.

“The little specimen from which the foregoing description was made out is doubtless a young shell. If not, it would not properly go into the group *Mortoniceras*, as its costæ and periphery are without nodes; the former being also more curved forward at their outer ends than is usual in the typical species of the same. Its costæ, however, on the outer volution show rather a distinct thickening at both extremities, and it is very probable that in larger adult individuals distinct nodes are developed. The lobes and sinuses of the septa would doubtless at that size be found more deeply divided and branched.

“It is on the supposition that this shell is a young example, in which the usual characters of the group *Mortoniceras* have not been fully developed, that I here refer it to that group. It might even be a young of the last, or of *M. vespertinum*.

“It is evidently not a young specimen of *Prionotropis woolgari*, as its costæ are broader and decidedly straighter than those of that species of the same size, and show no traces of the double node usually seen at their outer ends, even in smaller examples of the same; while its keel is also without the obscure crenulations of that shell, and the volutions less compressed. It is true that the crenulations of the keel in specimens of *P. woolgari* of this size are not well developed; but traces of them can usually be seen near the larger extremity of the outer turn at that stage of growth.

“*Locality and position.*—Mouth of Vermilion river, Nebraska, on the Missouri; where it was found in the Fort Benton group of the upper Missouri Cretaceous series.”

STEPHANOCERATIDÆ.

Genus ACANTHOCERAS Neumayr.

ACANTHOCERAS ? KANABENSE n. sp.

Pl. XXXVI, Figs. 6-8.

Shell discoidal with convex, slightly embracing whorls whose breadth is greater than the height; umbilicus about equal to the shorter diameter of the outer whorl; abdomen broad and gently convex with three rows of closely arranged rounded nodes, one on the median line and the others on either side half way between it and the peripheral margin. On the outer whorls the nodes of the median row tend to unite into a low keel. Sides of the whorl somewhat flattened; costæ on the earlier whorls numerous, angular, unequal in size and strongly curved forward in passing from the umbilicus to their termination at the outer rows of the abdominal nodes. On about the second whorl a few nodes

begin to develop near the umbilical margin and a larger number of stronger ones form a row near the peripheral margin. Occasionally two costæ unite at one of these outer nodes and again divide on leaving it. As the shell grows the smaller costæ disappear and the larger ones become rounded and less prominent until on the outer whorl of specimens an inch and a half in diameter each is represented by two large round nodes. At this stage there are about twice as many nodes in each row of the abdomen as there are in the row near the peripheral margin, so that all the suppressed costæ are apparently still represented by nodes on the abdomen.

Septa not very complex; the lobes all bipartite and the saddles more or less distinctly tripartite at their extremities. Abdominal lobe large and rather slender, being nearly twice as long as broad; first lateral saddle about the size of the abdominal lobe; superior lateral lobe much broader than the first lateral saddle, deeply bifid; inferior lateral lobe and saddle with the forms of those just described but much smaller. There are one or two very small auxiliary lobes and saddles.

The type specimens are three young shells and two fragmentary older ones, all of which are septate throughout. The largest specimen gives the following measurements: Diameter, 49^{mm}; height of outer volution, 16^{mm}; breadth of same, 26^{mm}.

This species seems to fall into the genus *Acanthoceras*, as defined in Zittel's Handbuch der Paleontologie, though that genus is made to include a number of groups that are apparently not very closely related. *Acanthoceras angulicostatum*, which may be regarded as the type of the genus, is certainly very different from our form. The latter seems to be related to *Amm. coleroonensis* Stoliczka.¹ The suture is of the same character and the form as shown in the small specimen (Fig. 4 of same plate) is quite similar, though there is no abdominal keel and the costæ pass entirely across the abdomen.

Locality and position.—Upper Kanab, Utah, about 350 feet above the base of the Cretaceous section. Another specimen collected from the Austin limestone near New Braunfels, Texas, belongs to the same or a closely related species.

Genus SCAPHITES Parkinson.

SCAPHITES LARVÆFORMIS Meek and Hayden.

Pl. XLIV, Fig. 2.

Scaphites larvæformis Meek and Hayden, 1856, Proc. Acad. Nat. Sci. Phila., p. 58; Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 418, Pl. VI, Figs. 6a, b, c.

Revised description:

“Shell small, transversely subovate, compressed, evenly rounded on the periphery; volutions slender, nearly round, the inner or coiled ones forming only a very small part of the entire shell, and so closely involuted as to leave only a very small umbilical pit; extended body-portion

¹ Fossil Cephalopoda of Southern India, Pl. XXXVII.

rather long, slender, and straight to the recurvature, thence continued backward until it comes nearly in contact with coiled inner volutions; aperture apparently circular; surface ornamented by small costæ, which pass from the inner side of the volutions to about half way across their lateral surfaces, where they swell into small, obscure, transversely elongated nodes, and then branch each into two or three smaller linear ribs, all of which pass straight over the periphery.

“Length, 0.87 inch; height, 0.63 inch; convexity, 0.33 inch.

“The septa of this species are comparatively rather simple, being each provided with but two principal lateral lobes on each side, none of which are deeply divided. The siphonal lobe is longer than wide, and has two very small, short, nearly parallel, obscurely bifid terminal divisions, with a more oblique, somewhat similar branch on each of the sides above. The first lateral sinus is wider than the siphonal lobe, and nearly as long, with its extremity deeply divided by a slender, obscurely trifid, auxiliary lobe, into two very unequal, more or less sinuous, and obtusely digitate branches. First lateral lobe about half as wide as the siphonal, but somewhat shorter, and bearing two very small terminal divisions similar to those of the siphonal lobe. Second lateral sinus not larger than the outer division of the first, and merely obscurely divided into very short, simple, obtusely rounded terminal subdivisions. Second lateral lobe very small and obscurely trifid at the end. Whether this last is what is usually called a ventral lobe, or whether there is another still smaller one beyond it, the specimen is scarcely in a condition to show.

“At one time I was inclined to think a very small species described by Dr. Shumard from the Cretaceous rocks of Texas, under the name *Scaphites vermiculus*, might be identical with this; but a sketch of that species sent to me some years back by Dr. Shumard shows it to be entirely distinct, being even a more slender, differently marked shell, with a proportionally much larger umbilicus and a longer deflected body-portion; that is to say, it presents the characters of the distinct section *Macroscaphites*.

“This species is perhaps more nearly allied to *S. Hugardianus* d'Orbigny,¹ than to any other foreign form, but yet differs too much to require a critical comparison or detailed statement of differences.

“*Locality and position*.—Eastern base of the Black hills; from the Fort Benton group of the upper Missouri Cretaceous series.”

SCAPHITES VERMIFORMIS Meek and Hayden.

Pl. XLIV, Fig. 3.

Scaphites vermiformis Meek and Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 22; Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 423, Pl. 6, Figs. 4a, b.

Revised description:

“Shell under medium size, ovate-subdiscoidal in form; umbilicus very small; inner regularly coiled volutions closely involute, deeply

¹Pal. Fr., 1, Terr. Crét., 525.

embracing and composing a rather large portion of the entire shell; deflected part very short, so as only to be slightly disconnected from the inner turns at the aperture, which is a little contracted and quadrato-subcircular in outline, with a slightly sinuous inner margin; surface ornamented by numerous straight costæ, which are rather small and nearly regular on the inner volutions, but become more distant and larger, as well as much more prominent, on the inner half of each side of the body-portion, where they each support a prominent node at the outer end, so arranged that those on opposite sides generally alternate; costæ all passing nearly straight across the periphery, on which they are of nearly uniform size, with the exception of their regular enlargement with the whorls.

“The nodes mentioned above are directed out at right angles to the sides of the shell, and, like the costæ, become again smaller toward the aperture. Most of the large costæ bifurcate at the nodes on the body-part of the shell, but their number is also increased by the intercalation of others between. Where they thus branch at the nodes on one side, the two divisions crossing over the periphery from the point of bifurcation never both connect at a node on the opposite side, but in most cases one, and sometimes each division, terminates between two of the nodes on the other side.

“The septate portion of the only specimen of this species in the collection being highly crystalline, the structure of its septa can not be very clearly traced out. The siphonal lobe, however, can be seen to be a little longer than wide, with a rather narrow body, provided with three branches on each side, the upper pair of which are small and nearly simple; while the next pair are longer and each bifid, and the terminal pair (which are larger than the second) are each ornamented by three small, pointed branchlets, or digitations, on the outer side. The first lateral lobe is somewhat irregularly tripartite; the lateral divisions being bifid and sharply digitate, while the terminal, which is not exactly central, is longer than the others and has about five pointed digitations, or sharp, nearly or quite simple, branchlets. The first lateral sinus can be seen to be deeply divided at the extremity into two nearly equal branches. The second lateral sinus can also be so far traced as to show that it is not more than about one-third as large as the first, nearly as long as wide, and regularly tripartite; and this is as far as the structure of the septa can be made out from the specimen.

“Length, 2.10 inches; height, 1.76 inches; greatest convexity, measuring to the extremities of the nodes on opposite sides, 1.25 inches; same between the nodes, 1 inch.

“This species is somewhat related to *S. hippocrepis* Dekay, sp. (= *Ammonites hippocrepis* Dekay¹), but differs in having its body-part less extended, and in being higher in proportion to its length. Its nodes are also larger and much more prominent; but the most marked

¹ Ann. N. Y. Lyceum, Nat. Hist., II, Pl. v, Fig. 5.

differences between these two forms are in their septa, the siphonal lobe of the form under consideration being proportionally much narrower, and provided with three, instead of only two, branches on each side, while its first lateral lobe is tripartite (an unusual feature in the genus) instead of bifid. It is also related to *S. Texanus* Roemer,¹ though its septa differ as widely from those of that species as from those of *S. hippocrepis*.

“*Locality and position*.—Chippewa point, near Fort Benton, on the upper Missouri; from the Fort Benton group of the upper Missouri Cretaceous series. Specimen discovered by Lieut. John Mullan, of the United States Topographical Engineers.”

SCAPHITES WARRENI Meek and Hayden.

Pl. XLIV, Figs. 4-7.

Scaphites warreni Meek and Hayden, 1860, Proc. Acad. Nat. Sci. Phila., p. 177; White, 1876, U. S. Geog. and Geol. Sur. West 100th Meridian, vol. iv, p. 200, Pl. 19, Fig. 3a; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 420, Pl. 6, Fig. 5; Whitfield, 1880, Geol. Black Hills of Dak., p. 444, Pl. 13, Figs. 1-4.

Scaphites warreni, var. *wyomingensis* Meek, 1876, *ibid.*, p. 421, Fig. 61-63 in text.

Scaphites wyomingensis Whitfield, 1880, *ibid.*, p. 446, Pl. 13, Figs. 5-7.

Compare *Scaphites æqualis* Sowerby.

Meek's description of the type is as follows:

“Shell small, transversely subovate, moderately compressed; inner volutions nearly circular, closely involute, and composing a comparatively rather large part of the entire bulk; deflected body-portion short and (perhaps accidentally) rather more compressed proportionally than the inner turns; surface costate, and without proper nodes; costæ small on the inner volutions, where they do not differ materially in size, but on the body-part about every fourth or fifth one becomes more prominent than the others, and extends entirely across from the inner side to and over the periphery, in passing upon which they bifurcate, or give off lateral branches, so that the whole, with some intercalated ones, assume there a uniform size; aperture and septa unknown.

“Length, 1.45 inches; height, about 1.22 inches; convexity, about 0.57 inch.”

The type is an imperfect specimen that does not show the entire form nor the septa. Afterward other examples were found that showed these details and that differed slightly from the type in form and surface ornamentation, so that they could not be positively identified with it, and Mr. Meek therefore called them *Scaphites warreni*, var. *wyomingensis*.

Mr. Whitfield regarded this variety as a distinct species, assigning to it the smaller specimens with more compressed volutions. In discussing its relations with *S. warreni* he says: “The principal differ-

¹ Kreid. von Texas, tab. 1, Fig. 4.

ences, therefore, between the two shells, and those which we deem of specific importance, are the greater length of the deflected part, the laterally compressed form of the volution, and the different direction of the costæ on the straight part of the shell. The two forms are associated at the same localities, and even occur in the same hand specimen of rock, but we think there is no difficulty in distinguishing them."

The septa of the two forms are essentially the same, the only difference being that those of the small specimens assigned to *S. wyomingensis* are slightly less complex. In all of them the septa are much more simple than in most species of the genus. The differences do not seem to me great enough nor constant enough to warrant the reference of these forms to distinct species, especially when we remember that they are associated in the same stratum. Other species of *Scaphites*, such as *S. nodosus*, certainly show greater variations. For comparison, copies are given of Meek's figure of the type of *S. warreni* and of Whitfield's figures of *S. warreni* and *S. wyomingensis*. After careful comparison of this species with *Scaphites æqualis* Sowerby, of the European Cenomanian, Prof. Meek regarded them as very closely allied.

Locality and position.—The type came from the southern base of the Black hills of Dakota, where it was found in the Fort Benton shales. It has been collected from the same horizon at many localities in Wyoming, Dakota, Colorado, New Mexico, and Utah.

SCAPHITES VENTRICOSUS Meek & Hayden.

Pl. XLIV, Figs. 8-10; Pl. XLV, Fig. 1.

Scaphites ventricosus Meek & Hayden, 1862, Proc. Acad. Nat. Sci. Phila., p. 22; Meek, 1876, U. S. Geol. Sur. Terr., vol. ix, p. 425, Pl. 6, Figs. 7 *a, b* and 8 *a, b*.

Revised description:

"Shell attaining a medium or larger size, oval, ventricose, broadly rounded over the periphery; inner turns closely involute, deeply embracing, and composing a large portion of the entire bulk; deflected portion very short; umbilicus very small and deep; aperture transversely sublunate or reniform, but deeply sinuous, and but slightly disconnected from the inner turns on the inner side; surface ornamented with costæ that pass nearly straight over the periphery, where they are of uniform size, excepting their gradual enlargement with the volutions, while on the sides of the last or outer volution, about every fifth or sixth one is larger and more prominent than the intermediate ones, which latter do not extend inward to the umbilical margin.

"The septa, as made out from the specimen represented by our figures 8*a, b* (believed to be the inner volutions of this species, as represented by figures 7*a, b*) are provided with deeply divided lobes and sinuses. Siphonal lobe longer than wide, and bearing on each side of its very slender body three branches, the two terminals of which are slightly larger than the succeeding lateral ones, and each unequally

bifid and digitate; first lateral sinus as large as the siphonal lobe, very narrow at its base, and profoundly divided at its extremity into two unequal branches, of which the one on the siphonal side is larger than the other, and, like the latter, deeply bifid, with sinuous and obtusely digitate margins; first lateral lobe as wide as the siphonal lobe, but somewhat shorter, and provided with two nearly equal, bifurcating, and digitate terminal branches; second lateral sinus not more than half as long, and little more than half as wide as the first, and somewhat similarly divided and subdivided; second lateral lobe about half as long and wide as the first, but tripartite at the extremity, the divisions being nearly equal and digitate; third lateral sinus small and merely provided with two nearly equal terminal branches, with more or less sinuous margins; third lateral lobe hardly more than half as large as the second, and bearing two very short, digitate, terminal divisions. Between the last-mentioned lobe and the umbilicus there is a minute, tri-digitate lobe, very similar to the auxiliary lobe of the third lateral sinus, but smaller.

“Length, 3.13 inches; height, 2.65 inches; convexity, 1.90 inch.

“In the style of its ornamentation this species resembles our *S. Warreni*, but it differs, however, remarkably in form and size, being much larger, and proportionally very decidedly more gibbous, with a proportionally smaller umbilicus. As the septa of the type of *S. warreni* are yet unknown, I have not had an opportunity to compare their structure with those of the form under consideration; but it is probable that they will be found to present differences in their details. Certainly those of the Wyoming form, that I now regard as only a variety of *S. warreni*, are quite different.”

Locality and position.—Chippewa point on the upper Missouri river, Fort Benton shales.

SCAPHITES MULLANANUS Meek & Hayden (sp.).

Pl. XLV, Figs. 2-4.

Ammonites mullananus Meek & Hayden, 1862, Proc. Acad. Nat. Sci., Phila., p. 63.

Ammonites?? mullananus Meek, 1876, U. S. Geol. Sur. Terr., vol. IX, p. 607, Pl. 8, Figs. 1a-c.

Compare *Scaphites subglobosus* Whiteaves, 1885, Cont. to Can. Palaeont, vol. I, p. 52, Pl. 7, Fig. 3 and Pl. 8.

Meek's revised description is as follows:

“Shell compressed-subglobose; rounded on the periphery; umbilicus small, deep, and acutely conical, between one-third and one-half as wide as the breadth of the outer whorl from the dorsal to the ventral side, showing about one-third of each inner volution. Whorls increasing rather rapidly in size, particularly in convexity, sloping on each side from near the umbilicus (with a slightly convex outline) toward the periphery, and rounding abruptly into the umbilicus on the inner side, each of those within deeply embraced by the succeeding turn.

Aperture transversely reniform or sublunate. Surface ornamented by rather small, regular, rounded costæ, which pass nearly straight across the sides of the whorls, and arch slightly forward in crossing over the periphery, on which from thirty-six to forty of them may be counted to every turn; each of those commencing at the umbilicus, usually there a little enlarged, especially on the larger whorls, so as to form a small subnodose prominence. Beyond these they all (particularly on the inner whorls) bifurcate regularly once, near the middle of each side, and on the larger turns others are also intercalated between, so as to make the number on the peripheral side five or six times as great as at the umbilicus.

“The septa are rather crowded, and provided with branched and deeply sinuous lobes and sinuses. The siphonal lobe is about one-fourth longer than wide, nearly obovate in form, and ornamented with three principal branches on each side, the two terminal of which are larger than the others, and each provided on the outer side with two or three more or less digitate lateral branchlets, while the inner parallel margins are merely sharply serrated. The first lateral sinus is of about the same size as the siphonal lobe, a little oblique, nearly oblong in form, and divided at the extremity into two tripartite and obtusely digitate branches, of which the one on the outer side is larger than the other; behind these it is provided on each side with two alternating lateral branches with sinuous margins. The first lateral lobe is narrower and shorter than the siphonal lobe, and provided with two principal branches on each side, the two terminal of which are much larger than the others, and of unequal size, the one on the right or peripheral side being the larger. Both of these terminal branches are distinctly bipartite, the subdivisions being ornamented with several branchlets and smaller digitations. The second lateral sinus is about half as wide and nearly two-thirds as long as the first, more or less oblique, and rather deeply divided at the extremity into two subequal, bifurcating, and obtusely digitate terminal branches. The second lateral lobe is as long as the second lateral sinus, but a little narrower, and ornamented with three variously digitate terminal branches, the middle one of which is longer than the others, a little oblique, and not exactly central. The third lateral lobe is small, being less than half as long, and scarcely two-thirds as wide as the second lateral, and provided with three nearly equal, spreading, digitate, terminal branches. Between the third lateral lobe and the umbilical margin there are two other small, very unequal, lateral lobes, the first of which has two or three digitations on each side, while the second is nearly simple or but slightly sinuous on the margins.”

The only examples of this species I have seen are the types, consisting of the specimen figured and a septate fragment of a much larger individual. As the body chamber is lacking these do not show whether the species had its last volution deflected and separated from the rest of the shell, still its apparently close relationship with *Scaphites ven-*

tricosus, as shown by similarity in form and in the character of the septa, seems to justify its reference to the same genus.

Scaphites subglobosus Whiteaves is probably identical with this species. The types of *S. mullananus* agree with the figures of *S. subglobosus* in every respect excepting that they do not show the small nodes near the periphery. The latter is reported from the "East Branch of the Poplar river, on the 49th parallel," where it is said to occur in the equivalents of the Montana formation.

Locality and position.—"Chippewa point, near Fort Benton, on the upper Missouri; Fort Benton group of the upper Missouri Cretaceous series."

ARTHROPODA.

CRUSTACEA.

A few fragments of the legs of a decapod crustacean were found in the Pugnellus sandstone at Poison canyon, Huerfano park, Colorado. They do not show either the generic or specific characters and they are mentioned here simply to record the rare occurrence of crustacean remains in this formation.

PLATES.

PLATE I.

PLATE I.

	Page.
SERPULA INTRICA White.....	53
Fig. 1. Copy of White's figure of the type.	
SERPULA TENUICARINATA M. and H.....	53
Fig. 2. View of the type specimen (after Meek).	
OSTREA PRUDENTIA White	54
Figs. 3, 4. Opposite views of one of the types (after White).	
OSTREA ANOMIOIDES Meek.....	55
Fig. 5. Lower valve (after White).	
6. Upper valve (after White).	

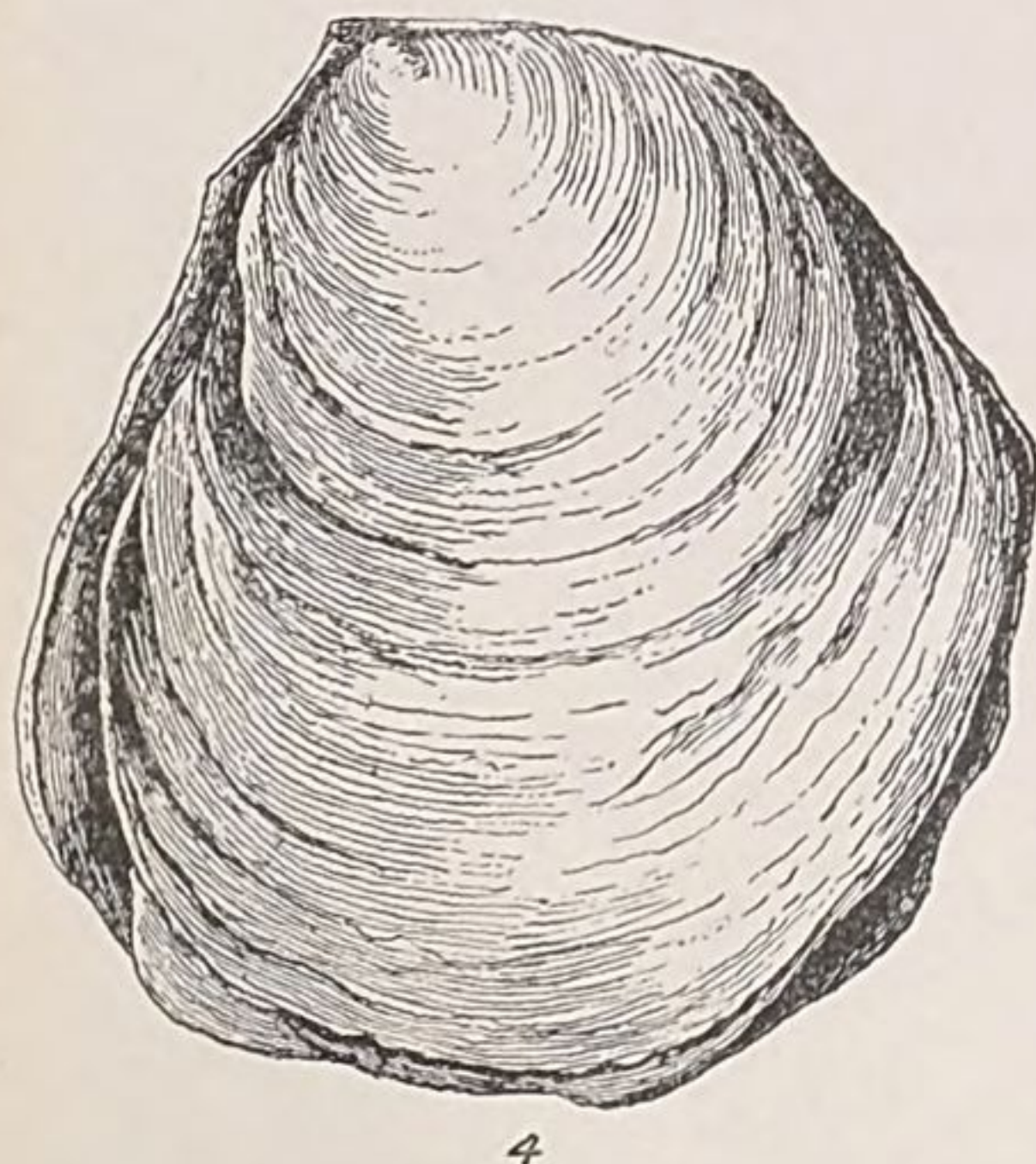
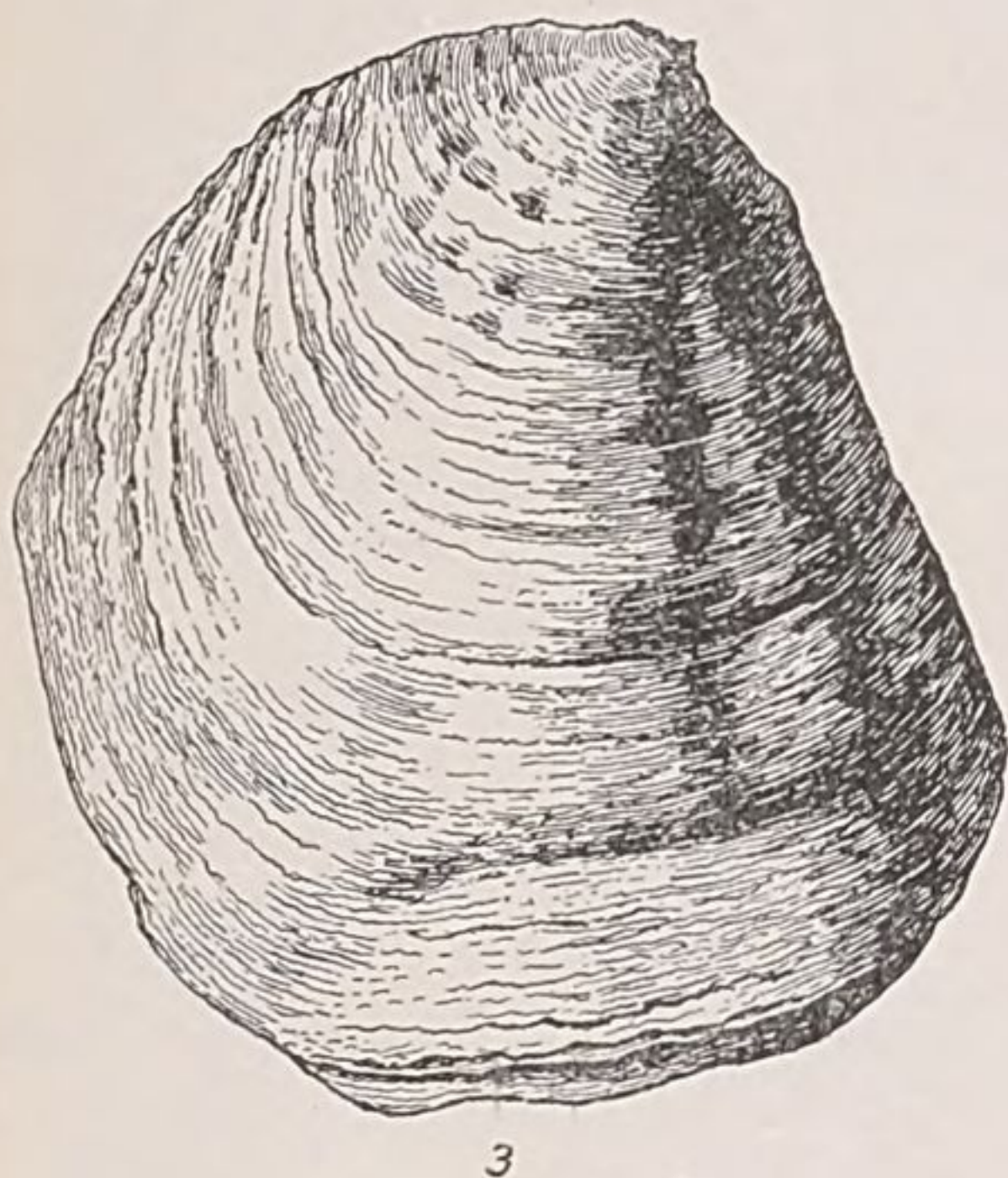
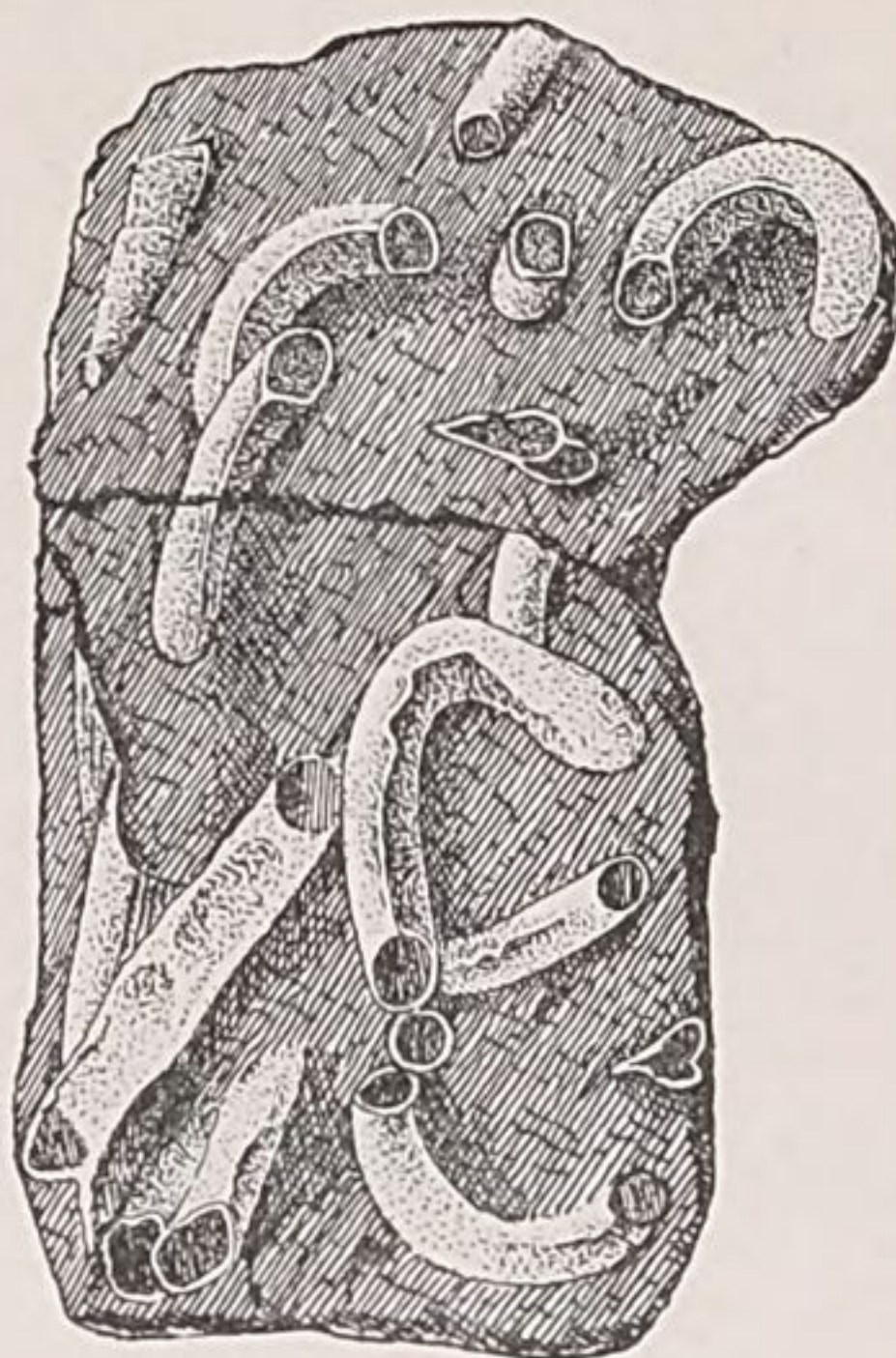
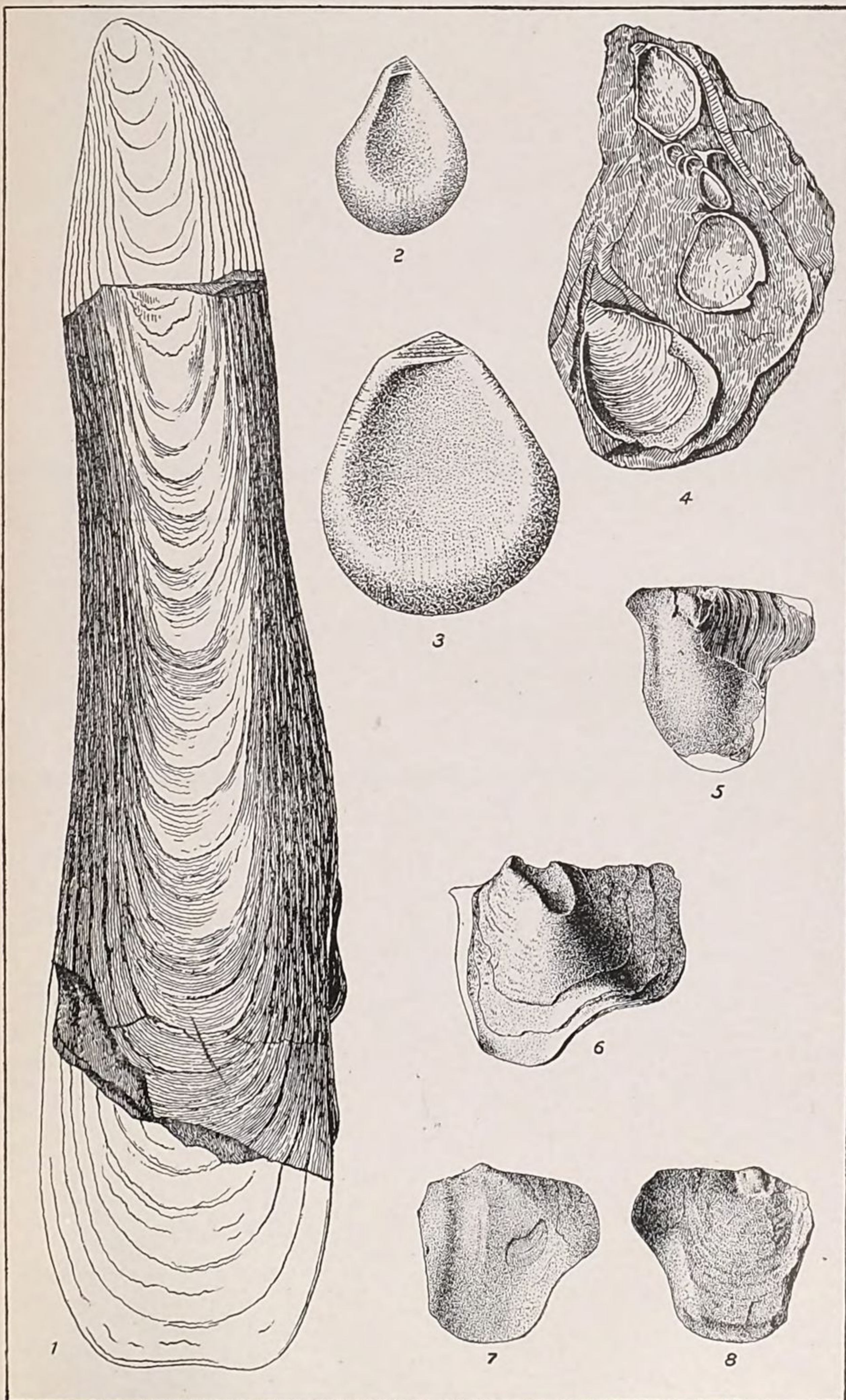


PLATE II.

PLATE II.

	Page
OSTREA SOLENISCUS Meek	56
Fig. 1. Upper view of a small example partly restored (after White). See additional figure on Plate III.	
OSTREA CONGESTA Conrad.....	55
Figs. 2, 3. Interior views of upper valves slightly enlarged (after Meek).	
4. Three small lower valves attached to the shell of a large <i>Inoceramus</i> (after Meek).	
OSTREA MALACHITENSIS n. sp.....	57
Nat. Mus. Cat. Invert. Foss., 22857.	
Figs. 5, 6. Lower valves of somewhat less than average size.	
7, 8. Opposite views of an upper valve.	



OSTREIDÆ.

PLATE III.

PLATE III.

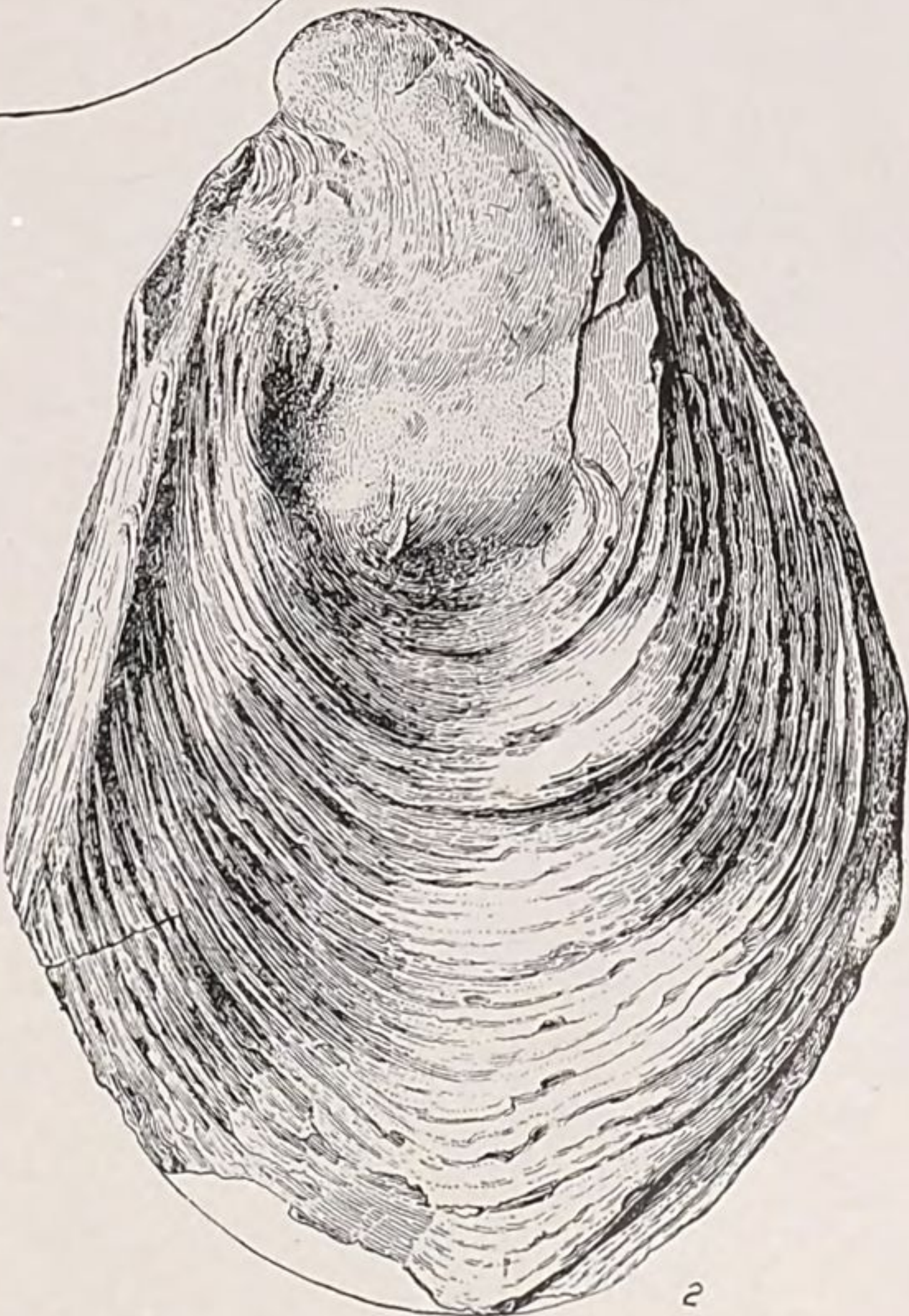
OSTREA SOLENISCUS Meek	Page. 56
Figs. 1, 2. External views of two broad exogyrate upper valves associated with the slender variety at Bear River city, Wyoming, and believed to belong to the same species. See Fig. 1 of Plate II.	
OSTREA UNIFORMIS Meek	59
Figs. 3, 4. Two views of the lower valve of the type (after White).	



1



3



2



4

PLATE IV.

PLATE IV.

Page.
58

OSTREA LUGUBRIS Conrad.....

Fig. 1. A small lower valve from eastern New Mexico. Conrad's type specimen.

Nat. Mus. Cat. Invert. Foss., 9822.

2. A small upper valve from Huerfano park, Colorado.

Nat. Mus. Cat. Invert. Foss., 22860.

3, 5. External and internal views of small lower valves from Mancos, Colorado.

Nat. Mus. Cat. Invert. Foss., 22859.

4, 6. Lower valves from Huerfano park, Colorado.

Nat. Mus. Cat. Invert. Foss., 22860.

7. A large lower valve from 20 miles above Pueblo, Colorado.

Nat. Mus. Cat. Invert. Foss., 22861.

8. A small lower valve of *Ostrea bellaplicata* from near Sherman, Texas, for comparison. Nat. Mus. Cat. Invert. Foss., 11882.

9. Interior of lower valve from Huerfano park, Colorado.

10. Cast of interior of upper valve from same region.

Nat. Mus. Cat. Invert. Foss., 22860.



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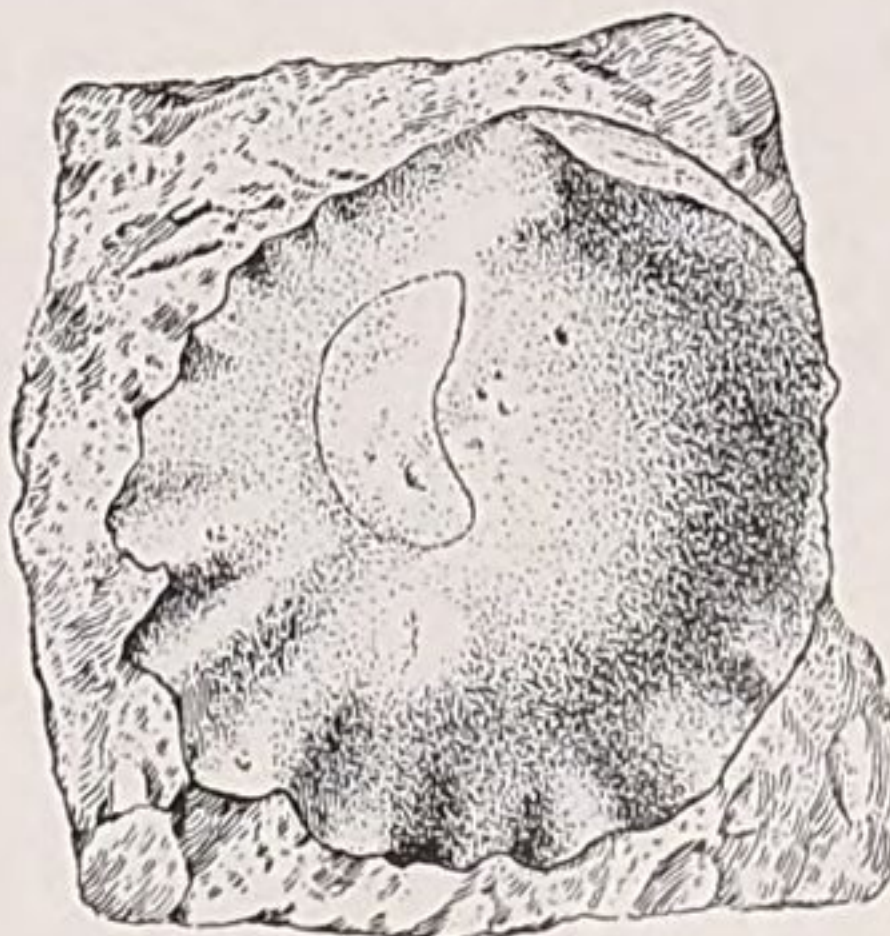
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8



9



10

PLATE V.

PLATE V.

	Page.
GRYPHÆA NEWBERRYI n. sp.....	60
Figs. 1, 2, 3. Different views of a small lower valve (after White).	
4, 5. Opposite views of a large specimen with both valves united.	
Nat. Mus. Cat. Invert. Foss., 8775.	
EXOGYRA SUBORBICULATA Lam	62
Fig. 6. Lower valve retaining a portion of the shell.	
(See Pls. VI and VIII for additional figures.)	
Nat. Mus. Cat. Invert. Foss., 22862.	

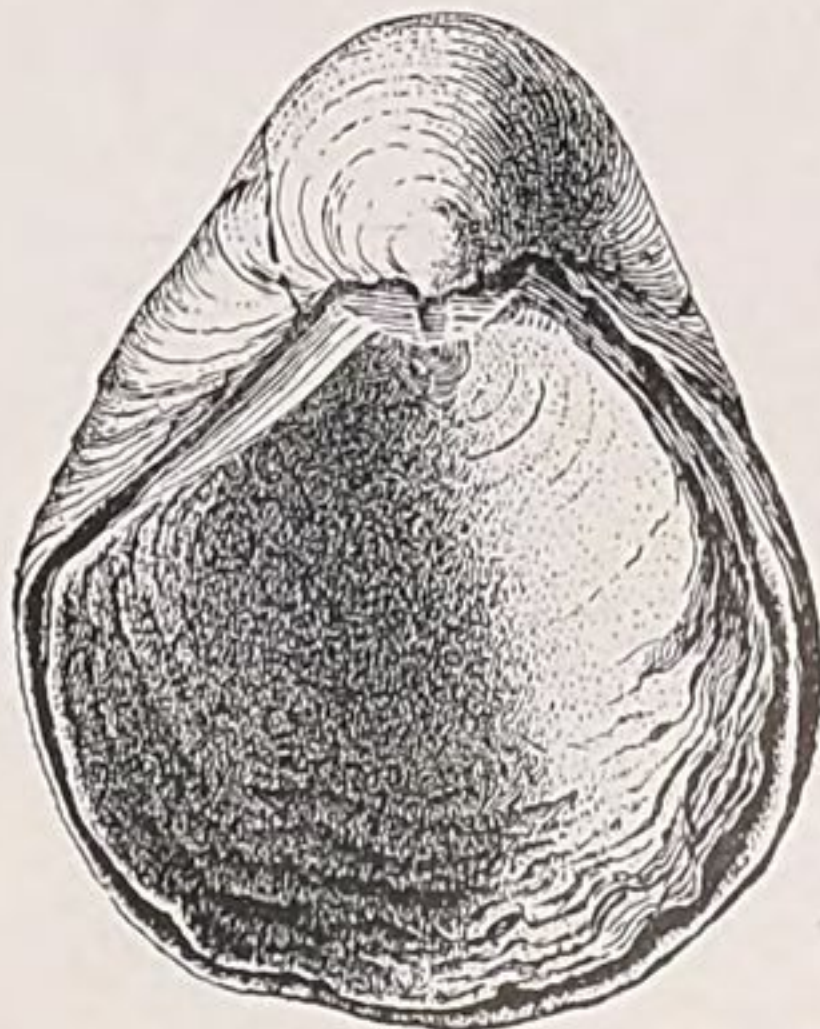
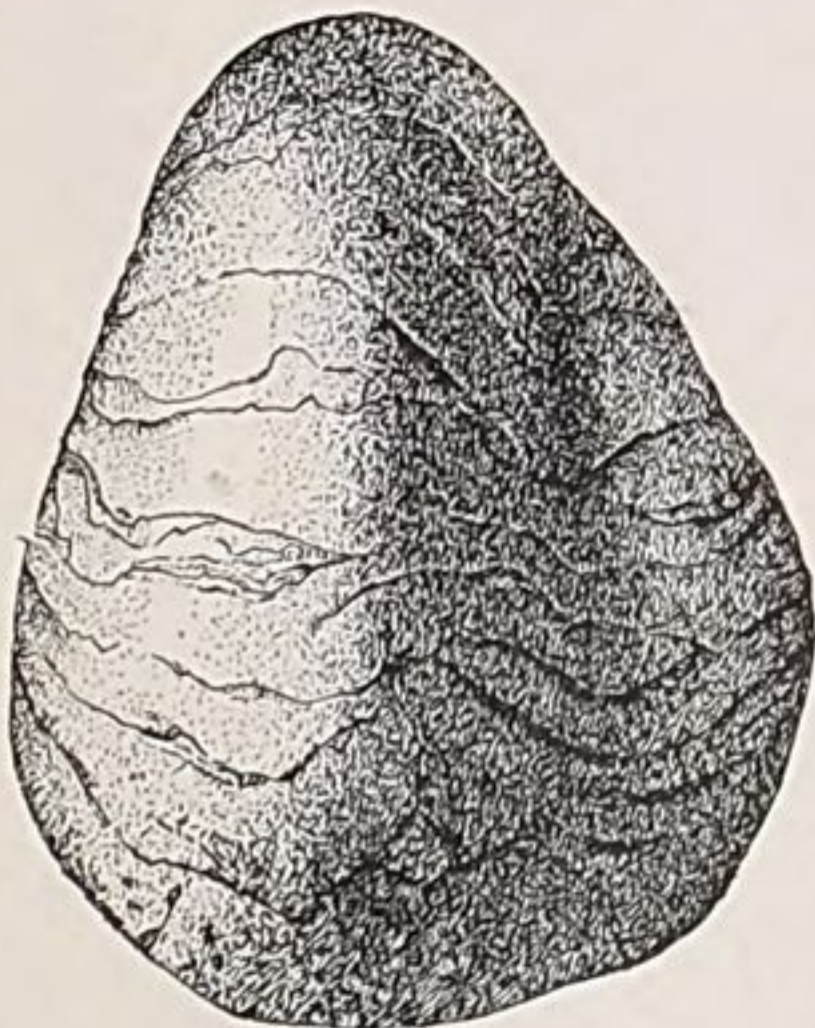
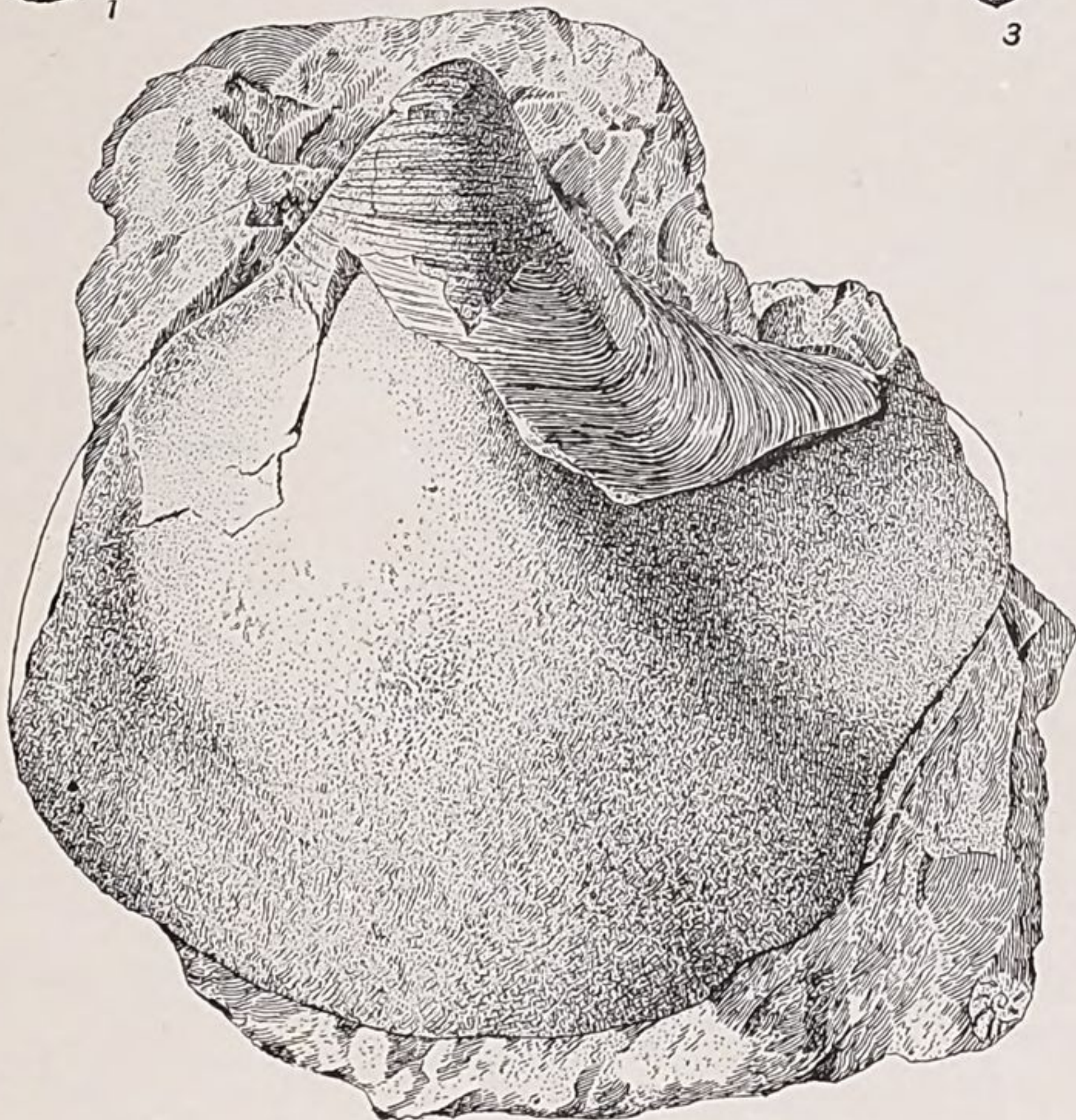
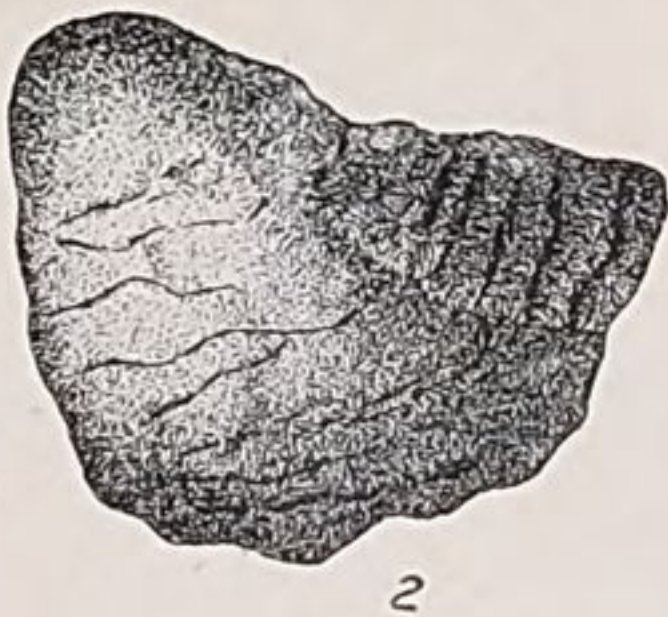


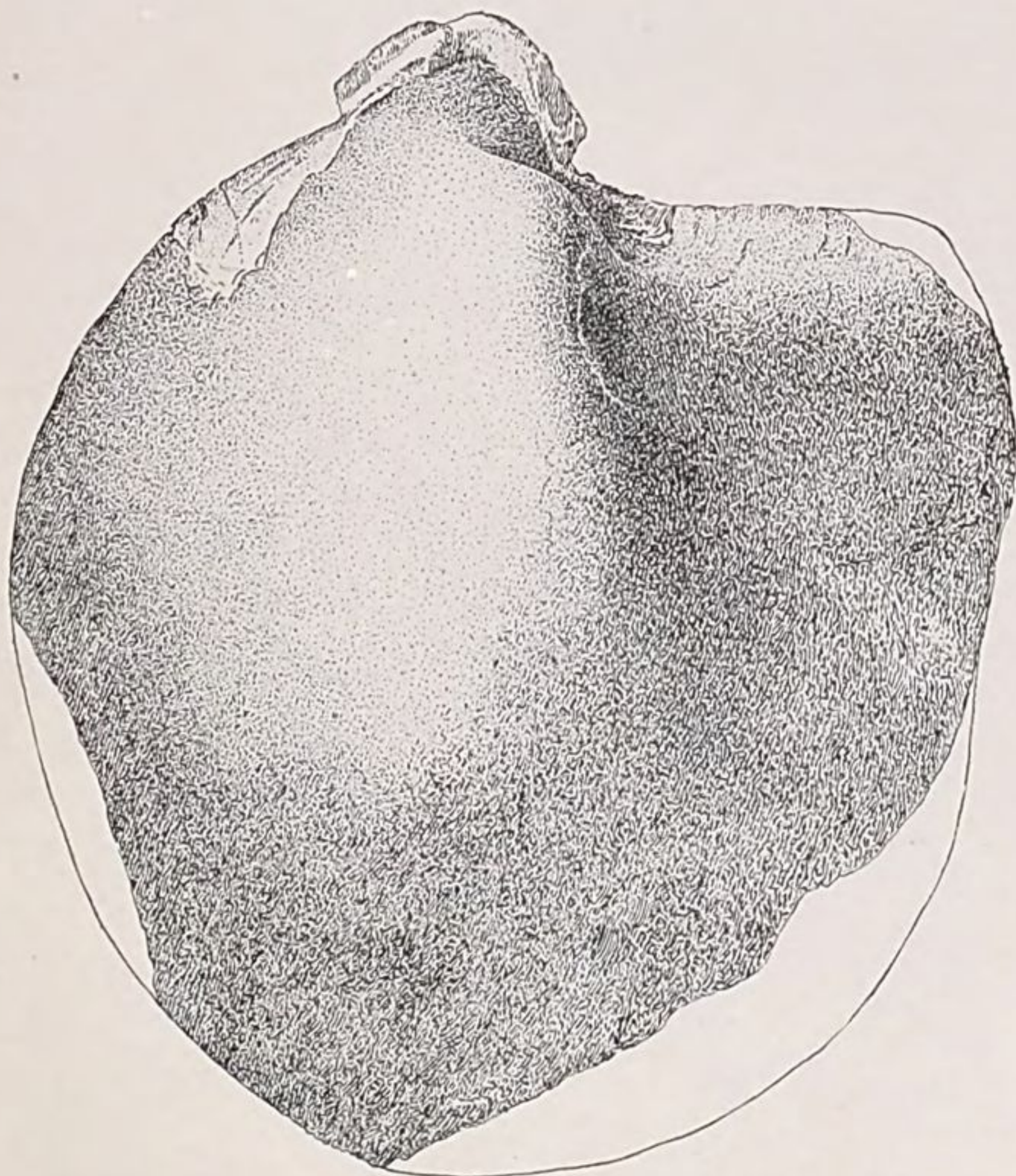
PLATE VI.

PLATE VI.

	Page.
EXOZYRA SUBORBICULATA Lam.....	62
Fig. 1. Posterior view of the specimen represented by Pl. v, Fig. 6.	
2. Cast of another large lower valve. (See Pls. v and viii for additional figures.)	
Nat. Mus. Cat. Invert. Foss., 22862.	



1



2

OSTREIDÆ.

PLATE VII.

PLATE VII.

	Page.
EXOXYRA PONDEROSA Roemer	65
Figs. 1, 2. Opposite views of a specimen from southern Utah (after White).	

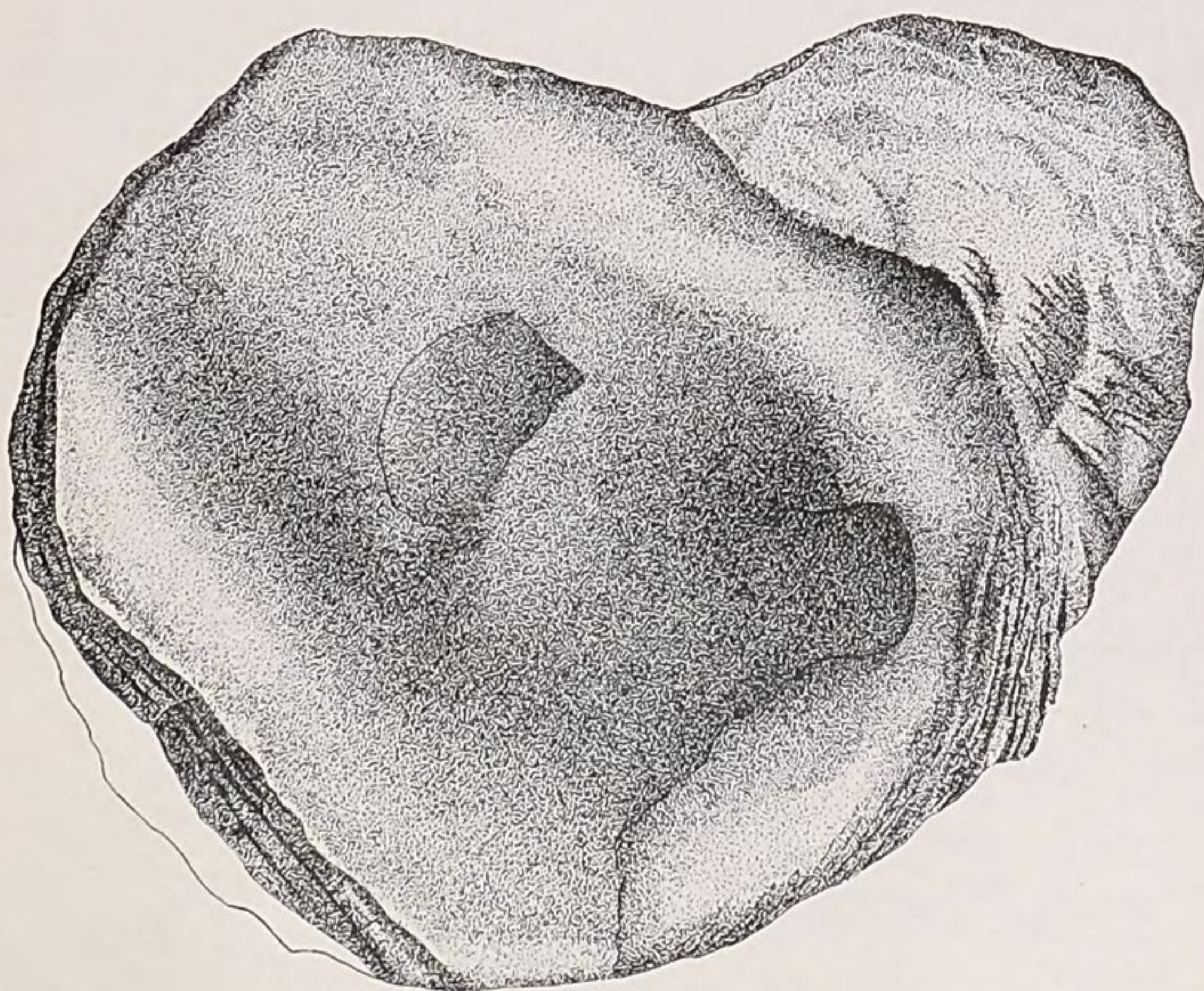
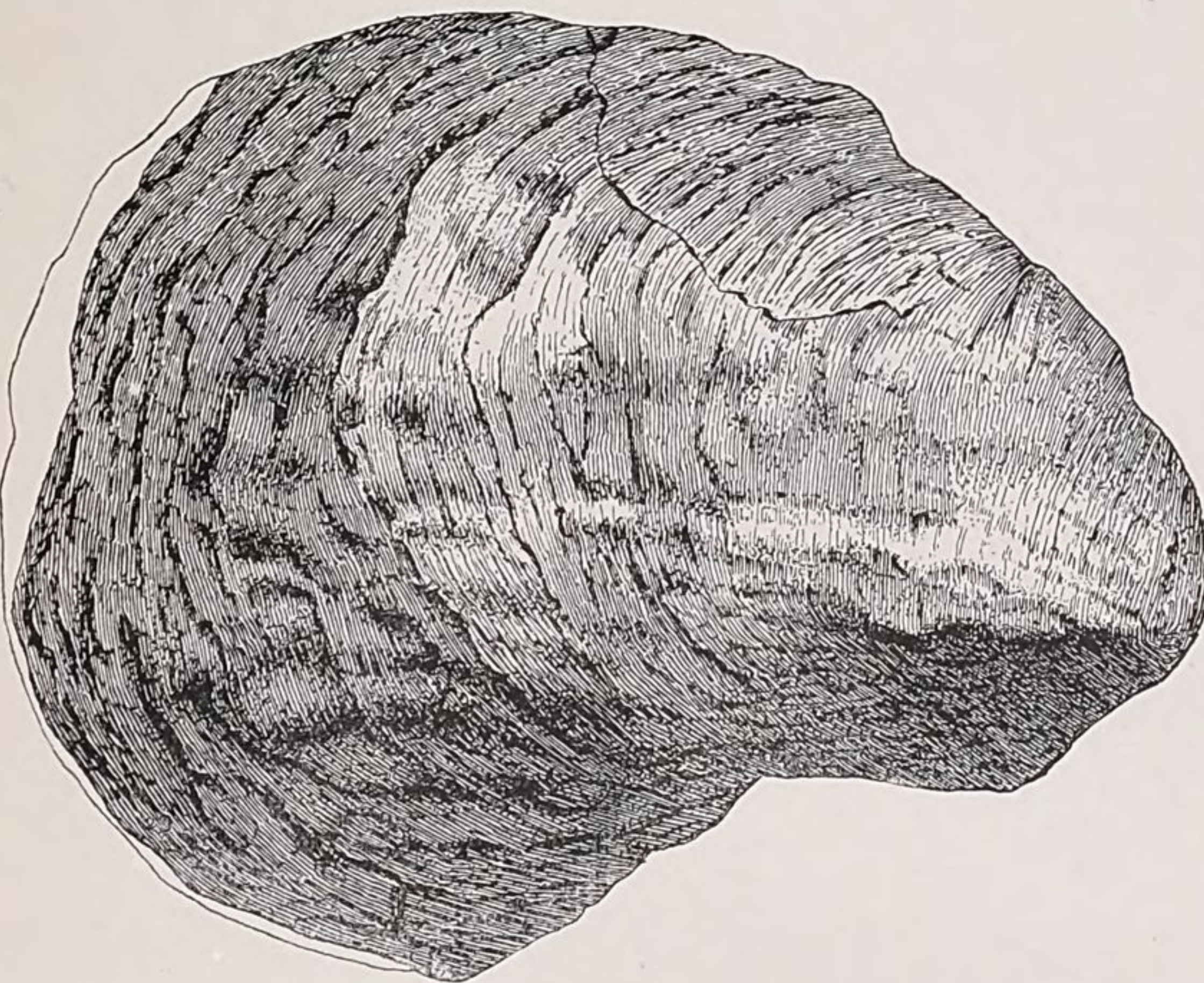
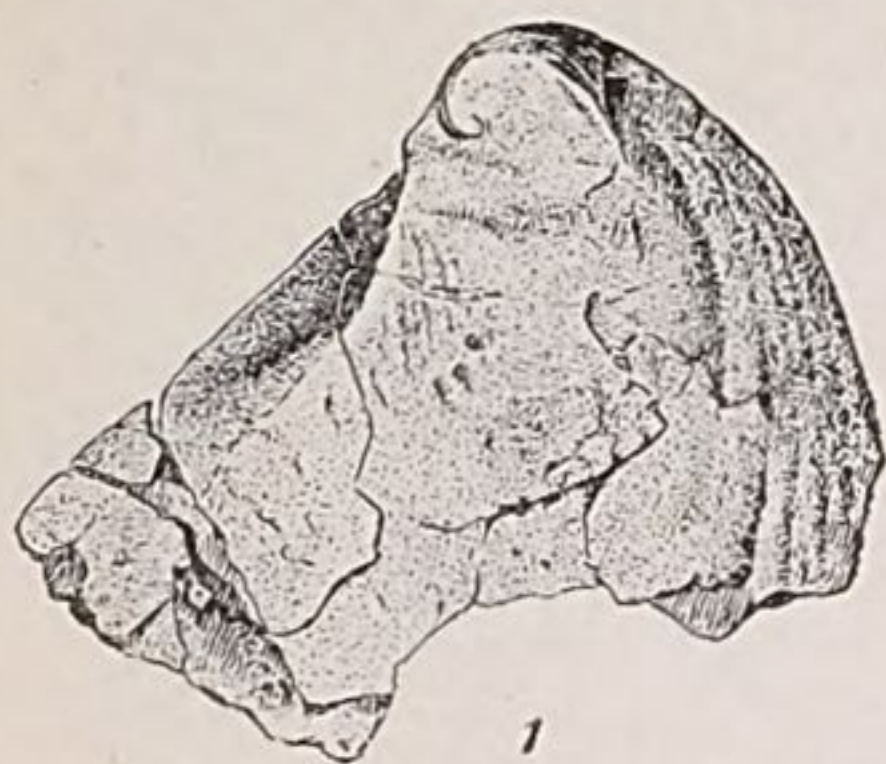


PLATE VIII.

PLATE VIII.

	Page.
EXOGYRA SUBORBICULATA Lam.....	62
Fig. 1. Fragment of an upper valve.	
Nat. Mus. Cat. Invert. Foss., 22863.	
EXOGYRA COLUMBELLA Meek	63
Fig. 2. Dorsal view of a large lower valve (after White).	
3. Side view of lower valve (after White).	
4. Upper view of specimen with both valves united (after White).	
EXOGYRA LÆVIUSCULA Roemer	64
Figs. 5, 6. Different views of lower valves (after White).	
ANOMIA CONCENTRICA Meek	67
Fig. 7. View of Meek's type specimen.	
Nat. Mus. Cat. Invert. Foss., 489.	
ANOMIA SUBQUADRATA n. sp.....	66
Figs. 8, 9. Casts of two upper valves retaining portions of the shell, and showing the variation in outline and convexity.	
Nat. Mus. Cat. Invert. Foss., 22864.	
ANOMIA PROPATORIS White?.....	67
Fig. 10. Upper valve slightly enlarged.	
Nat. Mus. Cat. Invert. Foss., 22865.	
PLACUNOPSIS? HILLIARDENSIS White.....	68
Fig. 11. View of the type specimen (after White).	



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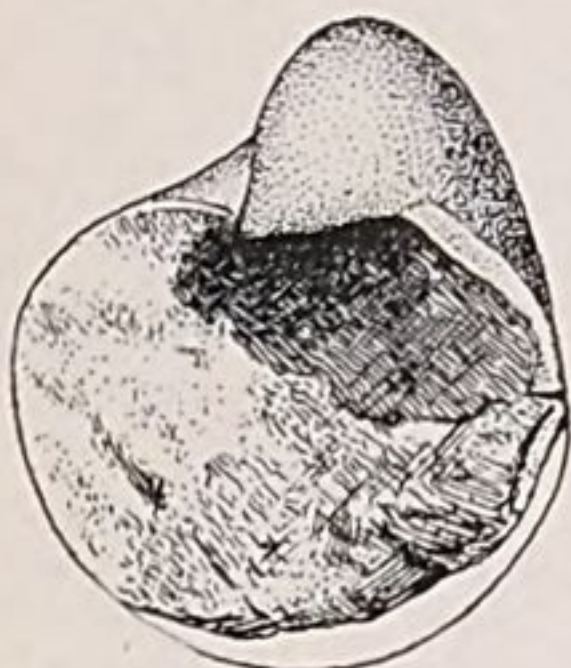
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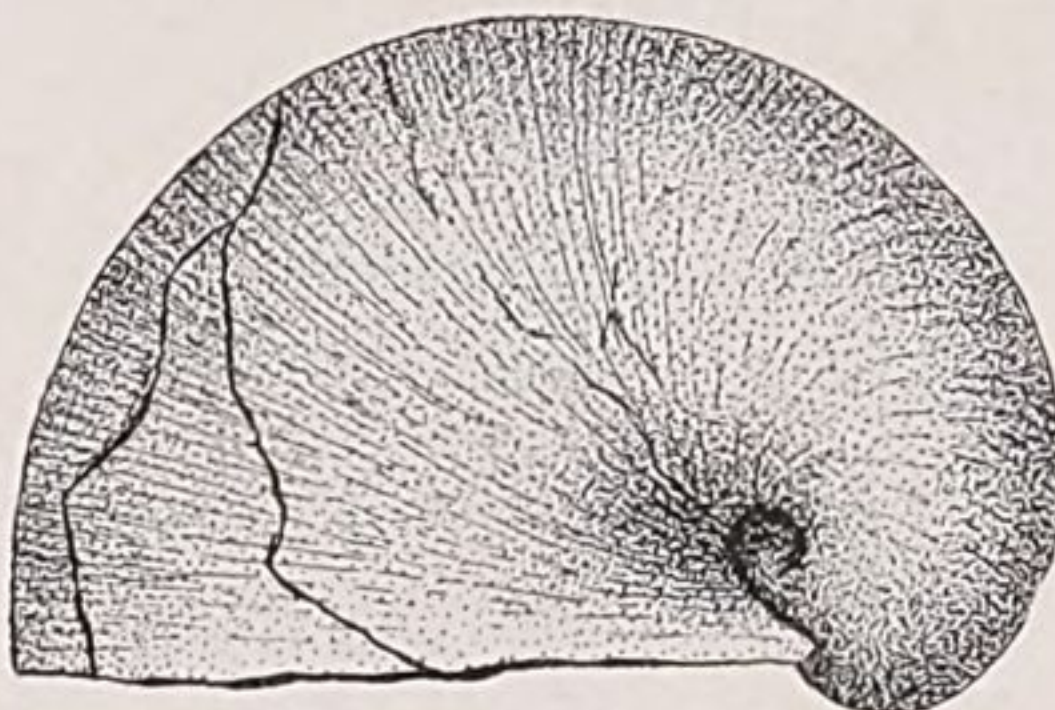
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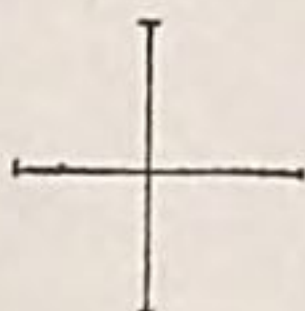
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9



10



11

PLATE IX.

PLATE IX.

	Page.
PLICATULA HYDROTHERCA White.....	69
Figs. 1, 2. Views of the opposite valves (after White).	
PLICATULA ARENARIA Meek.....	70
Figs. 3, 4. Views of the under and upper valves (after Meek).	
LIMA UTAHENSIS n. sp.....	71
Fig. 5. Cast of a large left valve.	
Nat. Mus. Cat. Invert. Foss., 22942.	
CAMPTONECTES PLATESSA White.....	72
Fig. 6. Right valve of the type (after White).	
AVICULA GASTRODES Meek.....	72
Nat. Mus. Cat. Invert. Foss., 22866.	
Fig. 7. Large left valve restored from two specimens which together show all the features drawn.	
8. A small left valve.	
9. 10. Two views of a more oblique specimen.	



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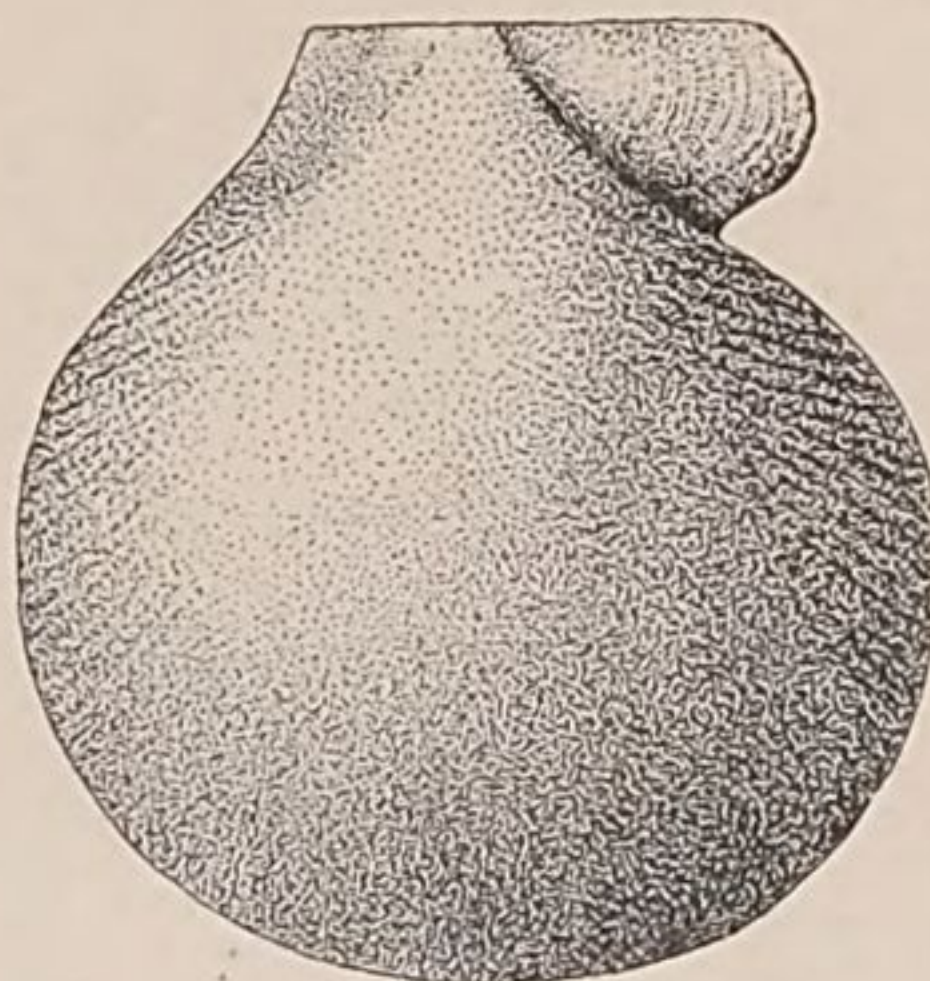
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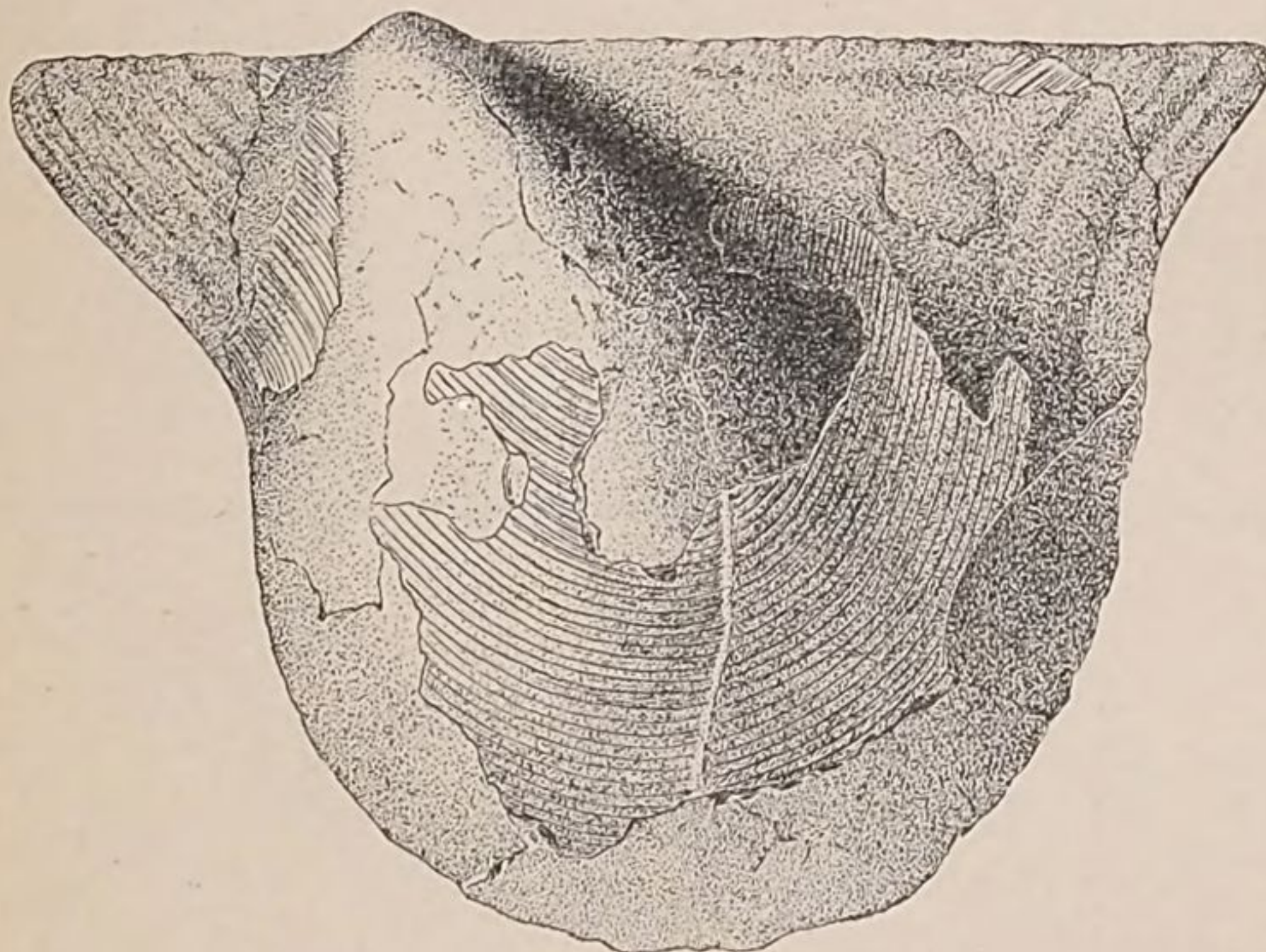
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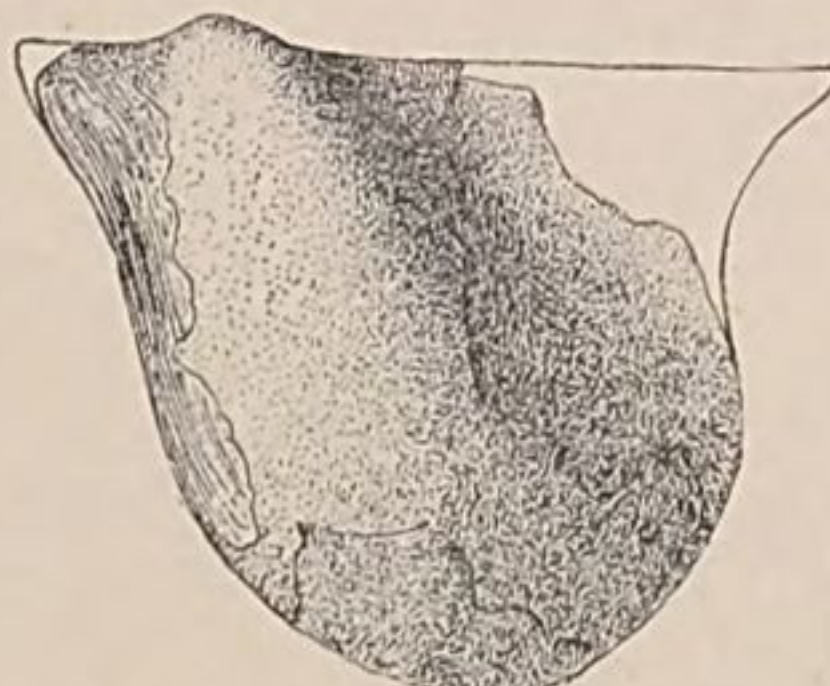
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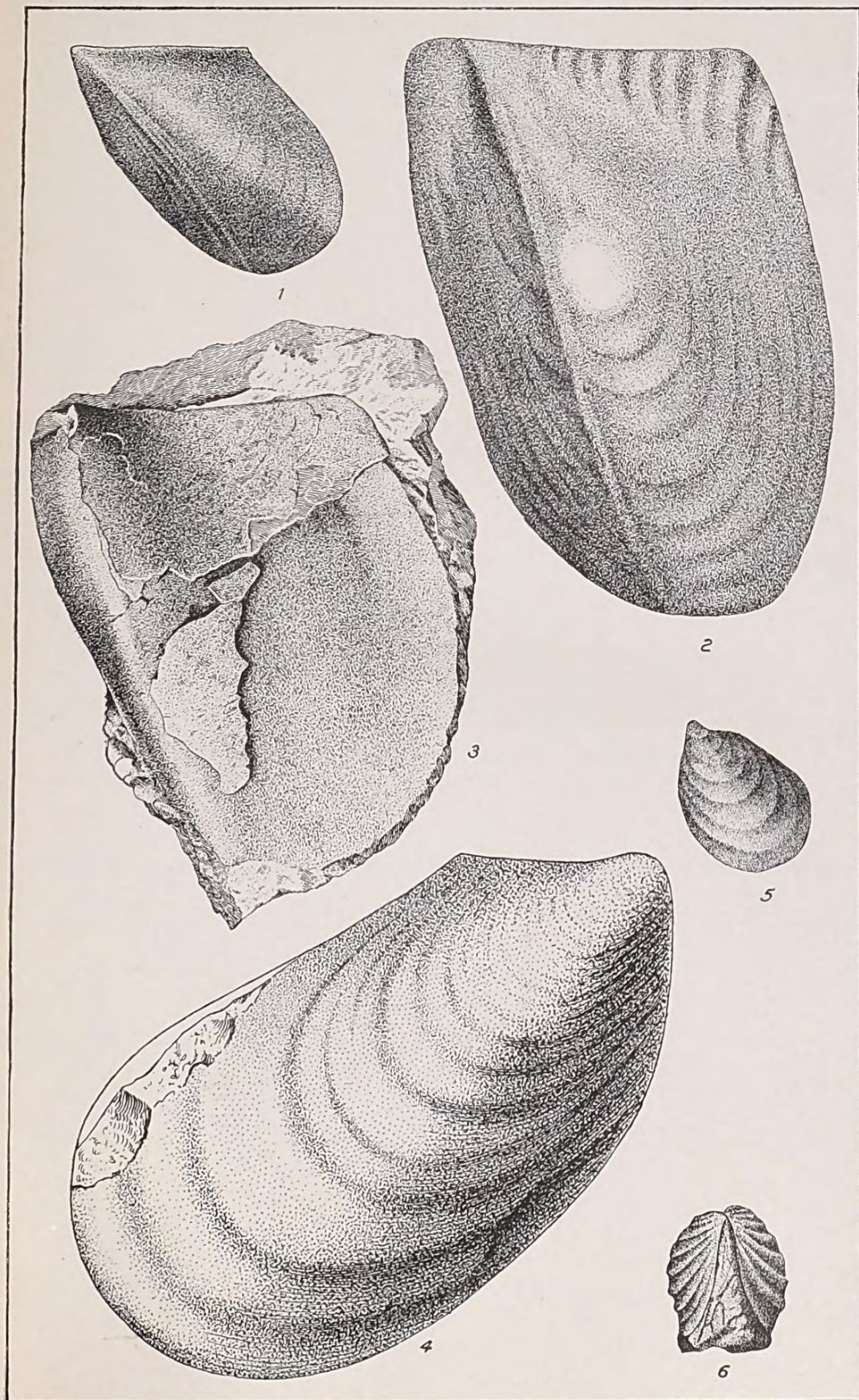


10

PLATE X.

PLATE X.

	Page.
GERVILLIA PROPLEURA Meek.....	74
Fig. 1. A small oblique left valve; one of Meek's types (after White).	
2. Left valve of an adult less oblique example; Meek's type of <i>Avicula</i> (<i>Pseudoptera</i>) <i>rhytophora</i> (after White).	
3. An imperfect cast of a left valve retaining a portion of the shell, from Huerfano park, Colorado. Nat. Mus. Cat. Invert. Foss., 22876.	
INOCERAMUS LABIATUS Schloth.....	77
Fig. 4. Right valve of an elongated specimen (after Meek). (See Pl. XIV, Fig. 1.)	
INOCERAMUS DIMIDIUS White.....	78
Fig. 5. Left valve of a specimen of average size (after White).	
6. Front view showing convexity of both valves (after White).	

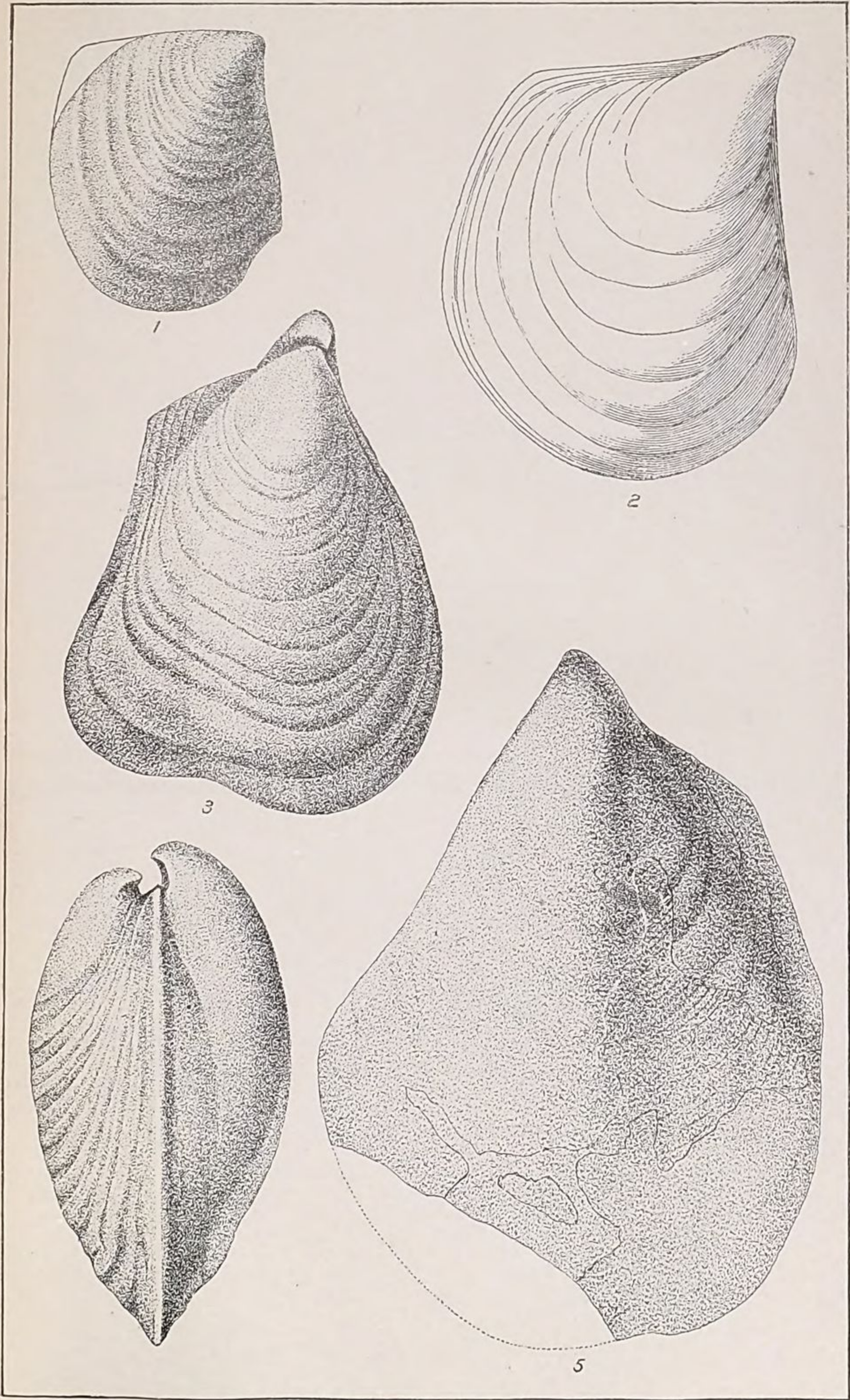


AVICULIDÆ.

PLATE XI.

PLATE XI.

	Page.
INOCERAMUS FRAGILIS H. & M.....	76
Fig. 1. Right valve of one of Whitfield's types of <i>Inoceramus perplexus</i> . Nat. Mus. Cat. Invert. Foss., 12274.	
2. A larger right valve (after Meek).	
3, 4. Two views of one of the types of <i>Inoceramus howelli</i> (after White).	
5. A large example selected from the types of <i>I. howelli</i> to show variation in form. Nat. Mus. Cat. Invert. Foss., 8052.	



AVICULIDÆ.

PLATE XII.

PLATE XII.

	Page
INOCERAMUS SIMPSONI Meek.....	79
Fig. 1. Right valve of the type specimen (after Meek).	

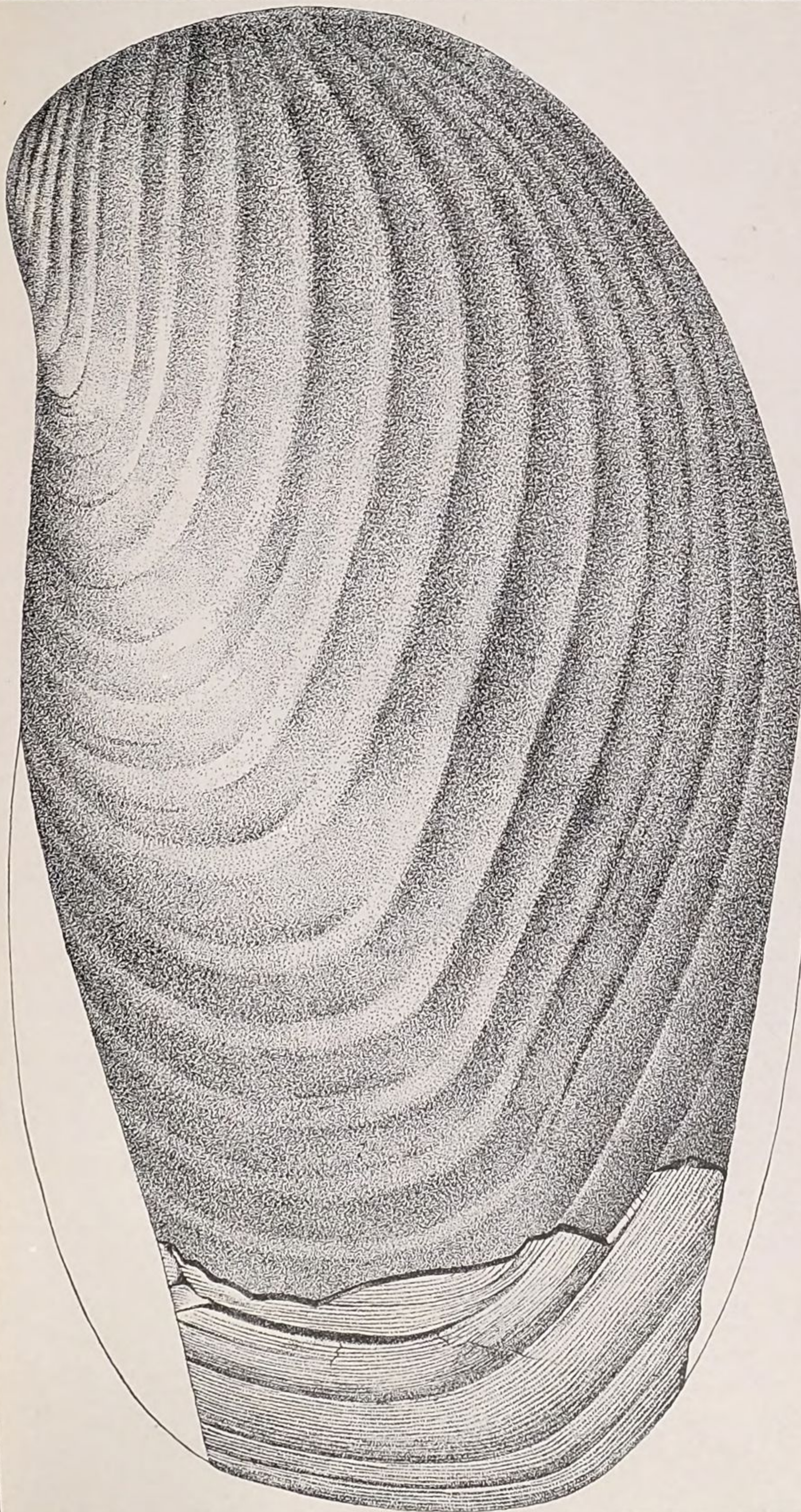


PLATE XIII.

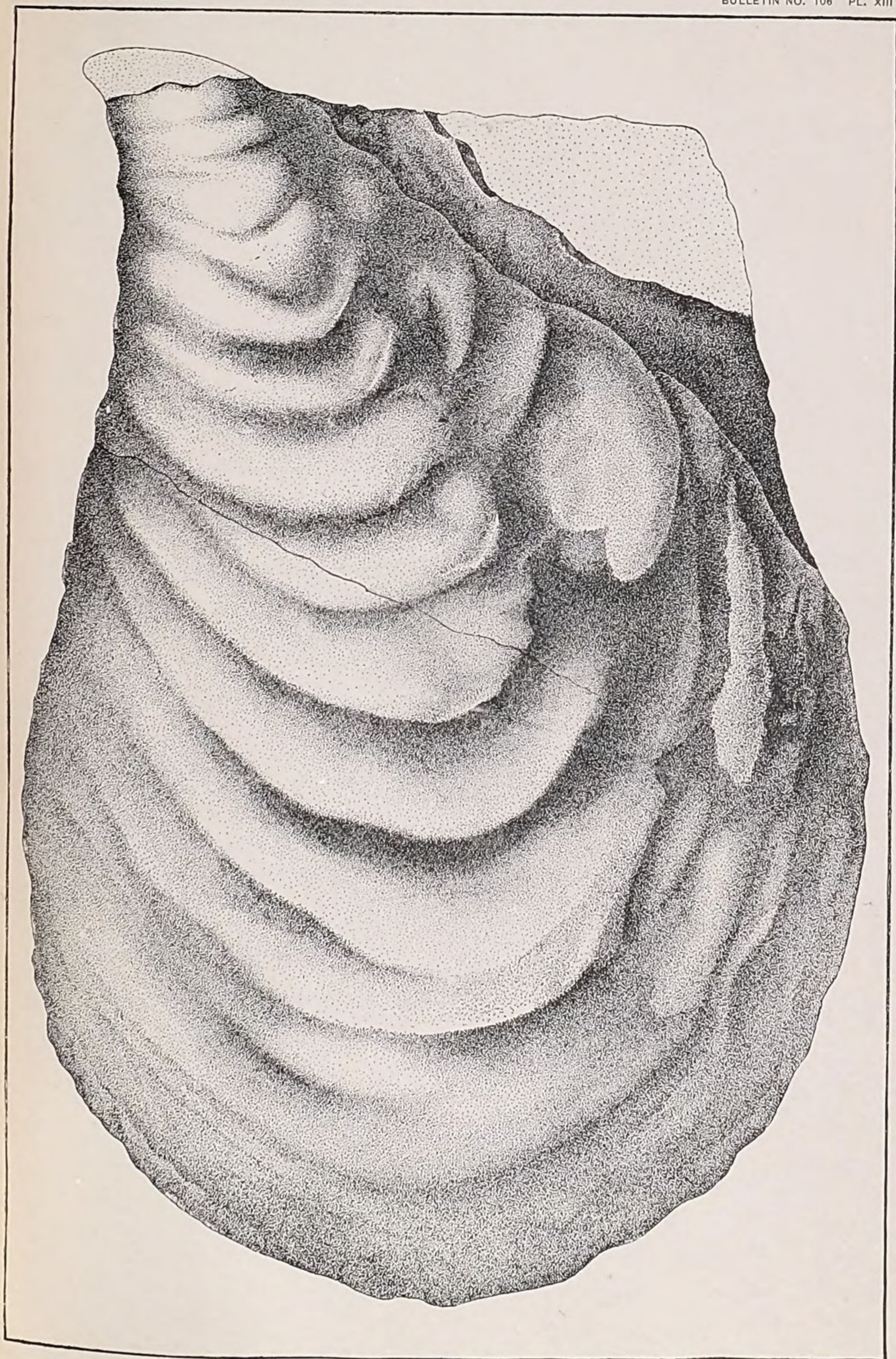
PLATE XIII.

INOCERAMUS FLACCIDUS White.....

Page
80

Fig. 1. Left valve of type (after White).

218

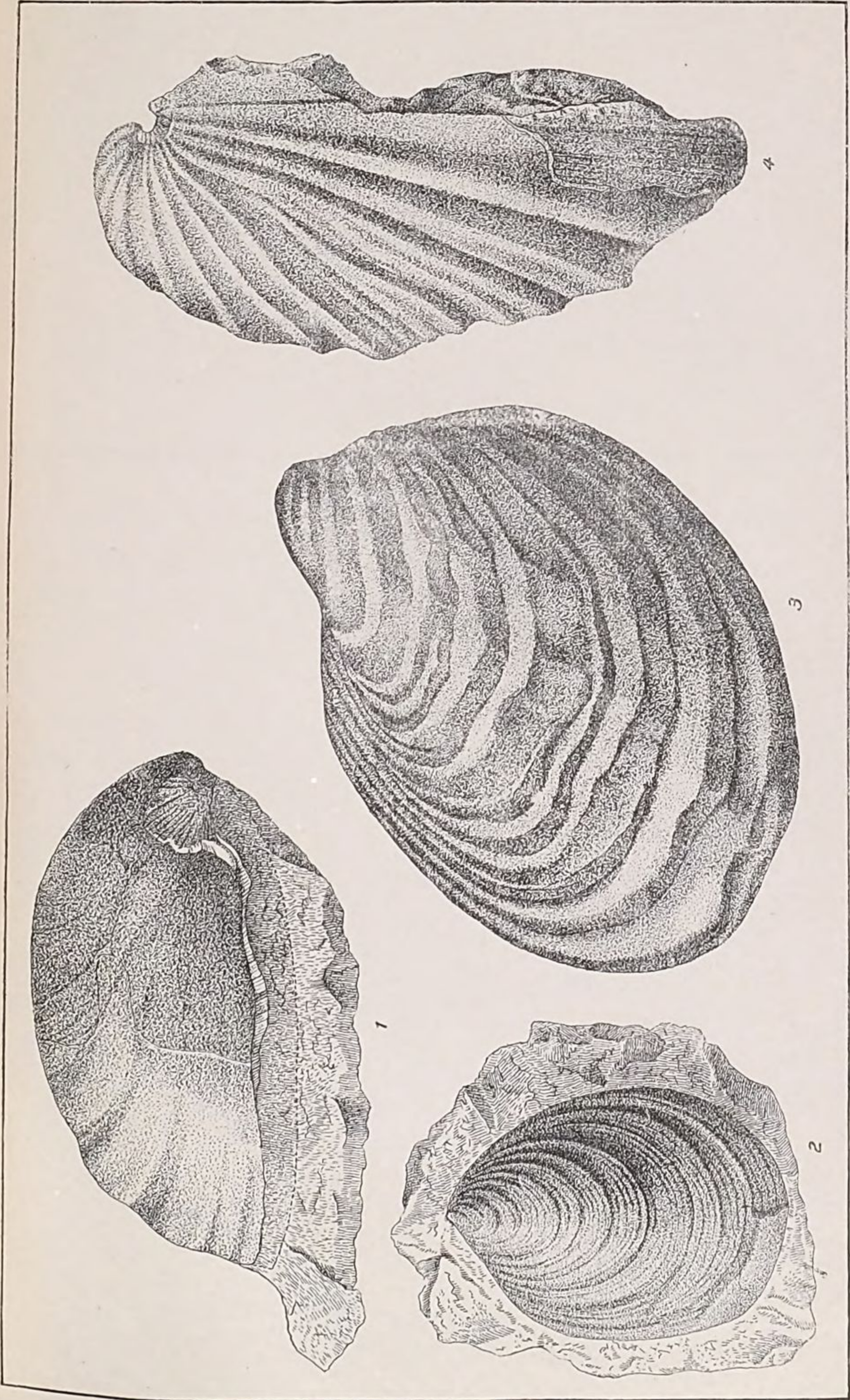


AVICULIDÆ.

PLATE XIV.

PLATE XIV.

INOCERAMUS DEFORMIS Meek	Page 85
Fig. 1. Anterior view of small specimen. (See Pl. xv.) Nat. Mus. Cat. Invert. Foss., 21119.	
INOCERAMUS LABIATUS Schloth	77
Fig. 2. Small right valve with unusually strong concentric ridges. (See Pl. x, Fig. 4.) Nat. Mus. Cat. Invert. Foss., 22868.	
INOCERAMUS GILBERTI White.....	79
Figs. 3, 4. Two views of a left valve (after White).	

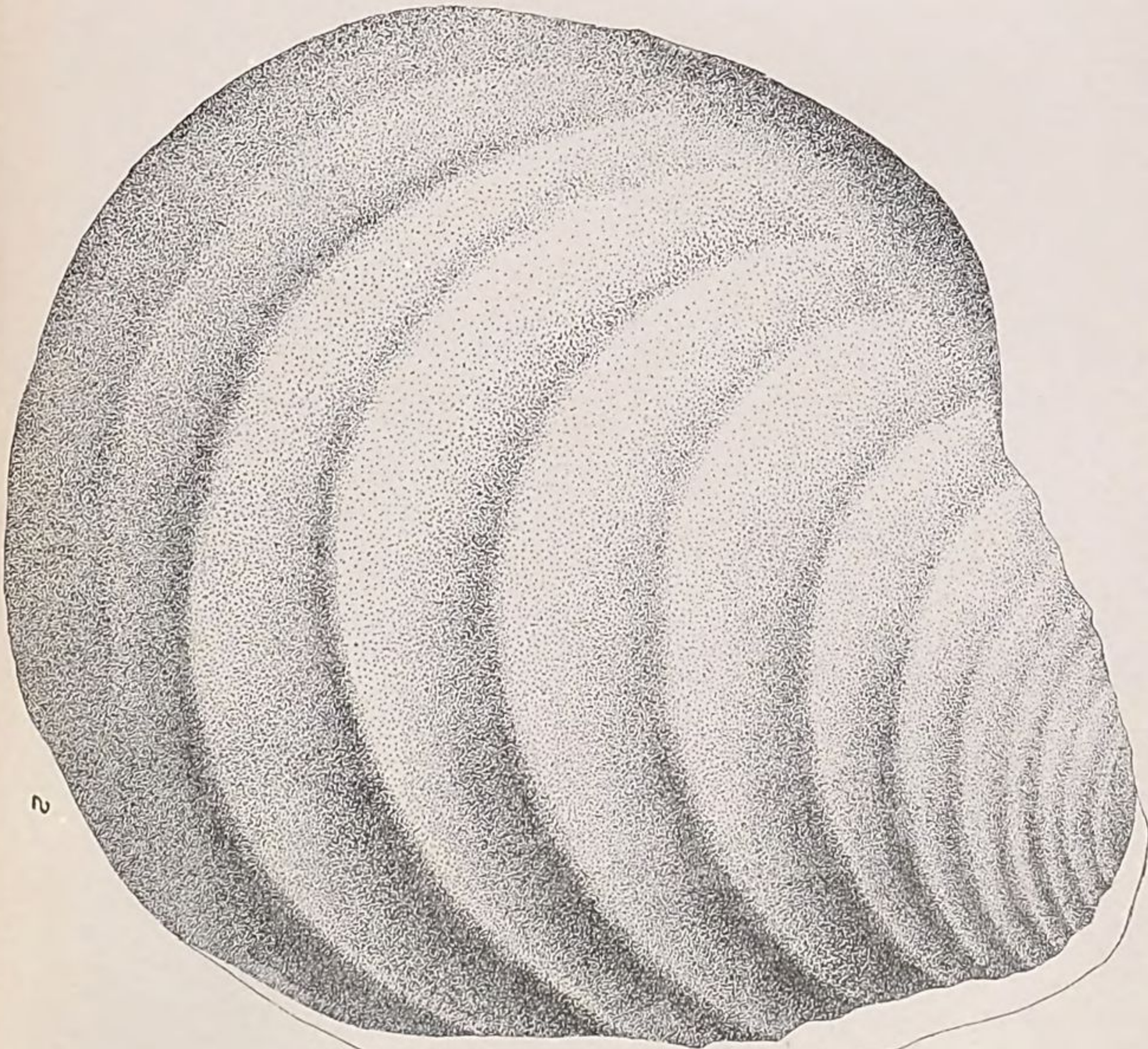
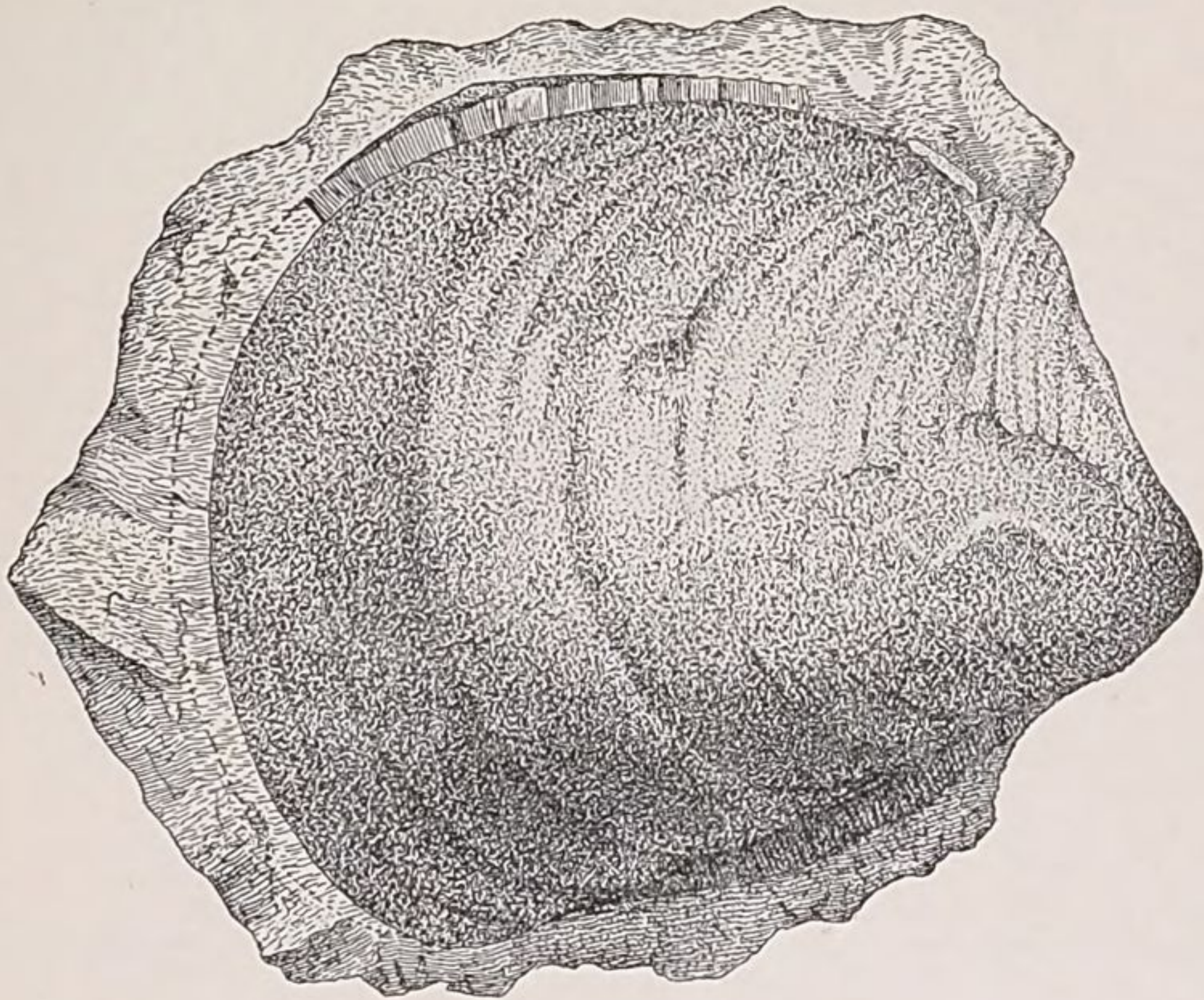


AVICULIDÆ.

PLATE XV.

PLATE XV.

	Page.
INOCERAMUS DEFORMIS Meek.....	85
Fig. 1. Another view of the small specimen represented by Pl. XIV, Fig. 1.	
2. A larger right valve (after Meek).	



2

AVICULIDÆ.

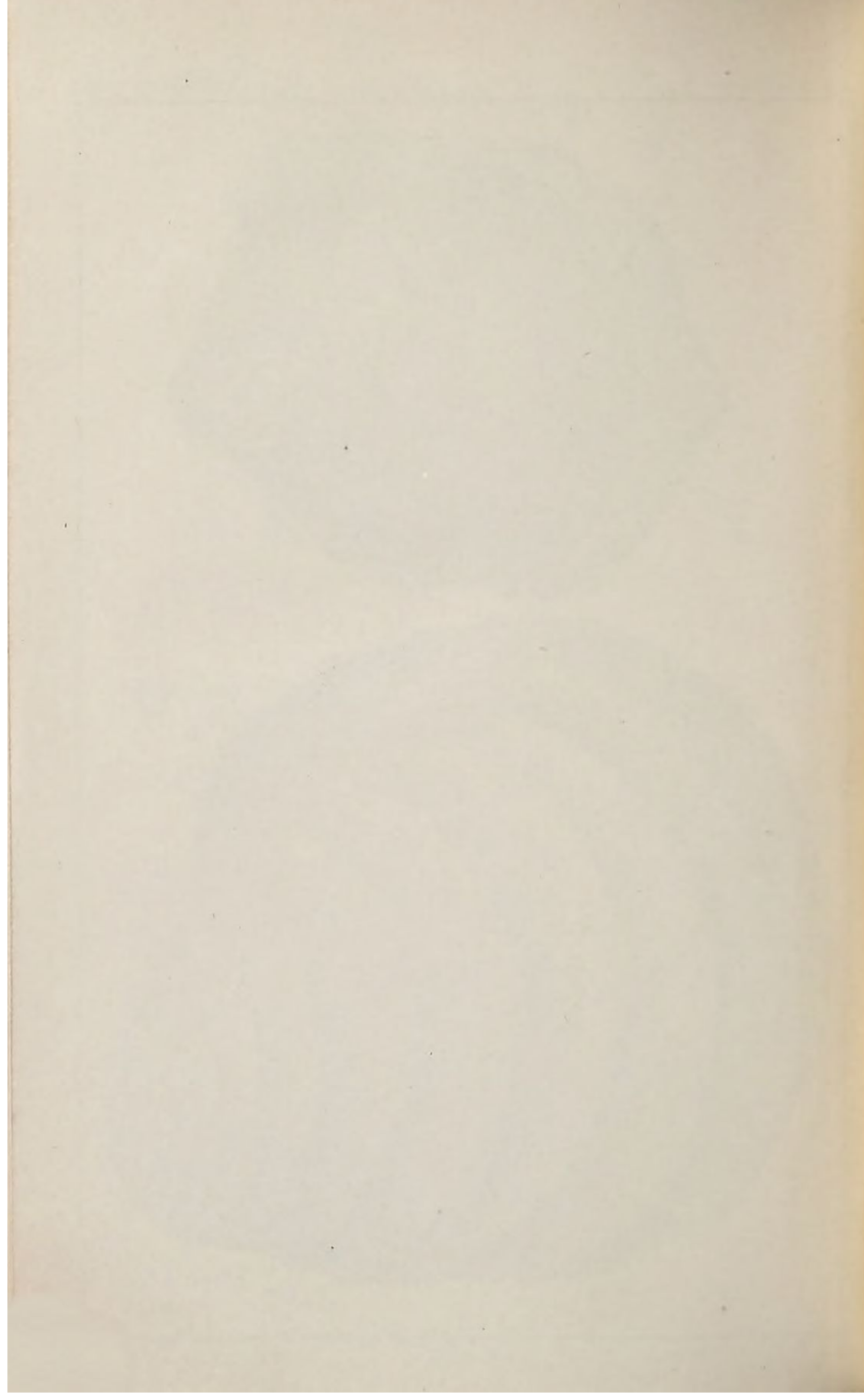
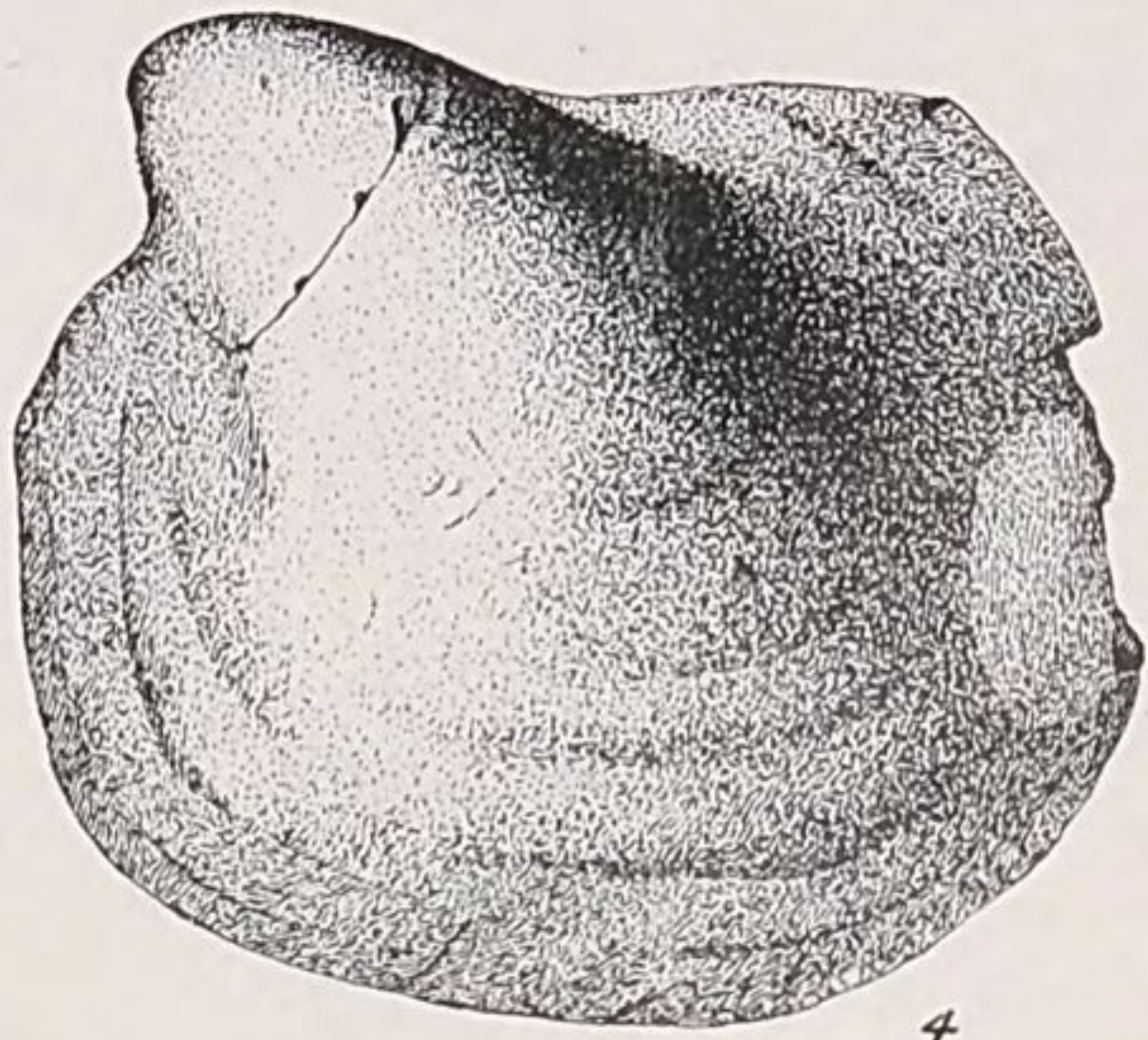
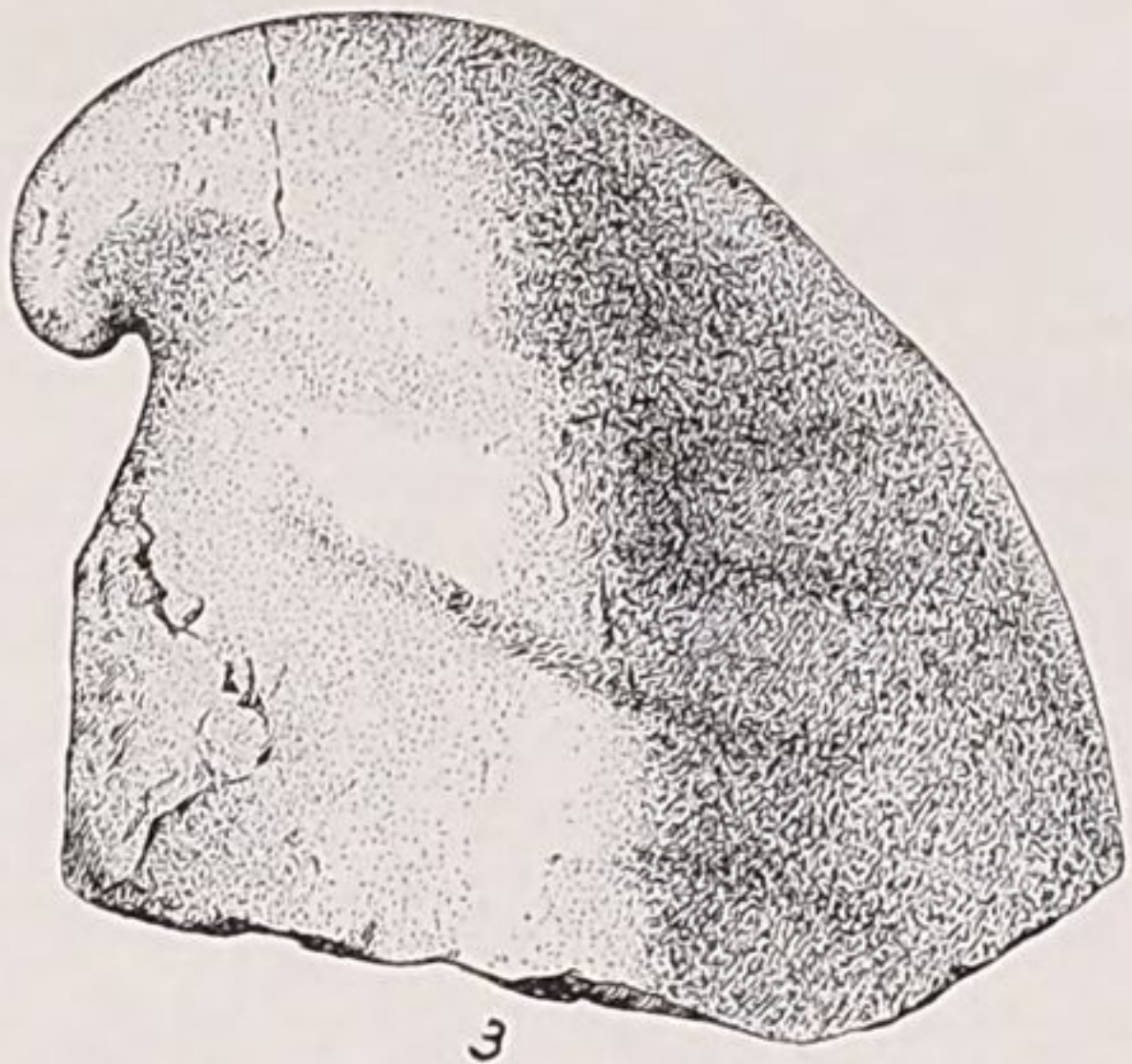
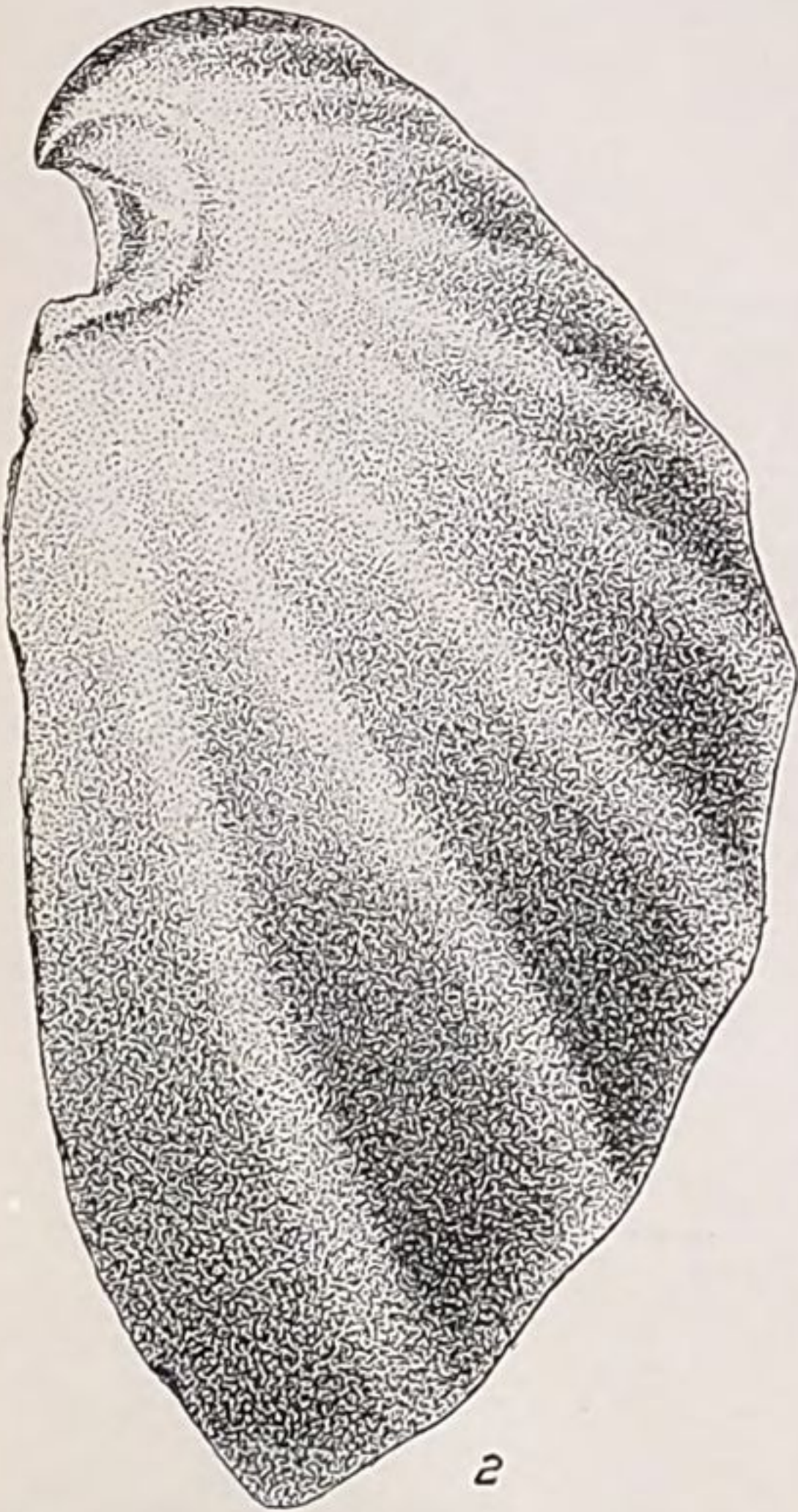
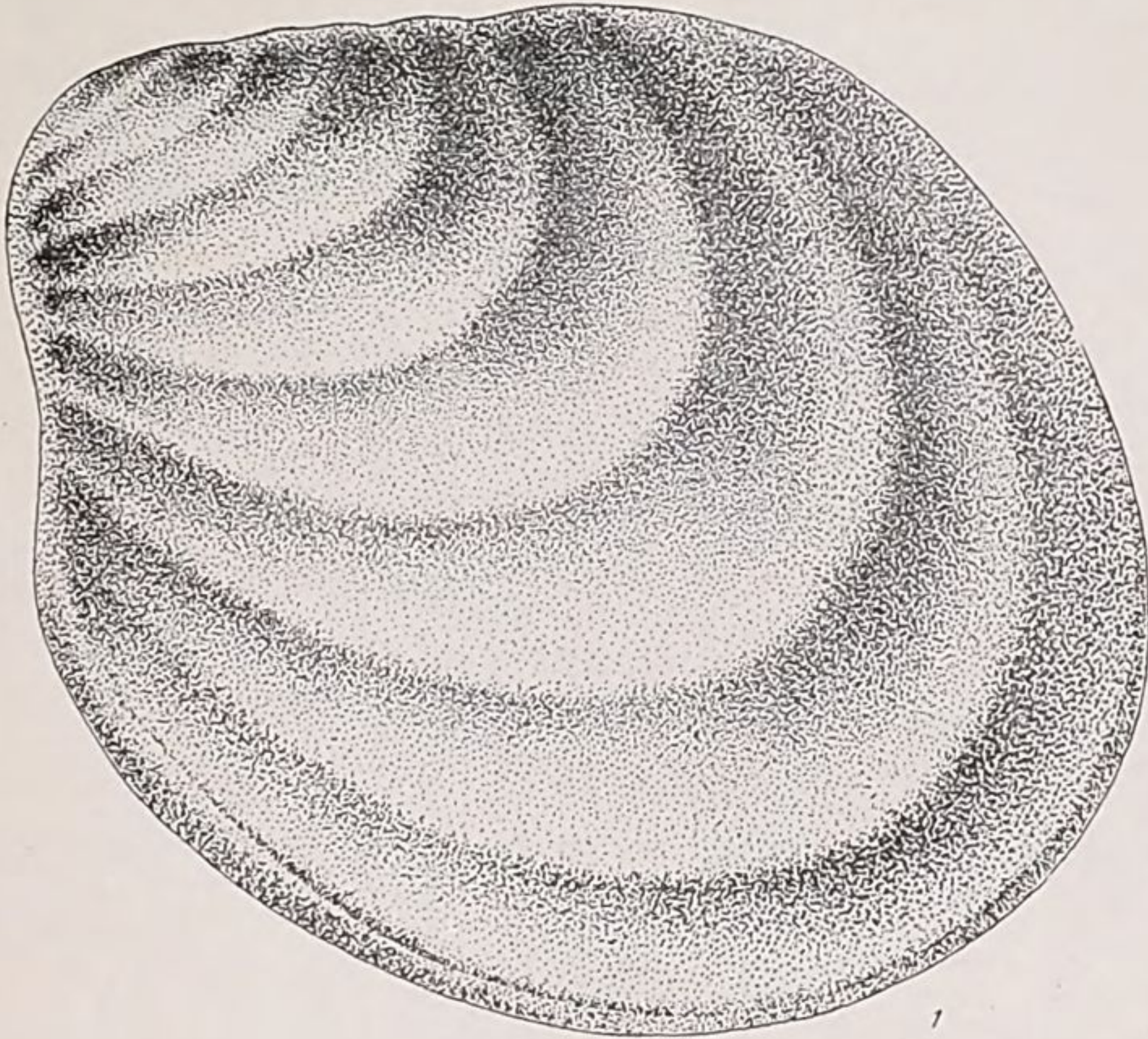


PLATE XVI.

PLATE XVI.

INOCERAMUS UNDABUNDUS M. & H	84
Figs. 1, 2. Two views of a left valve (after Meek).	
INOCERAMUS TENUIROSTRATUS M. & H	83
Figs. 3, 4. Two views of the type specimen.	
Nat. Mus. Cat. Invert. Foss., 1906.	



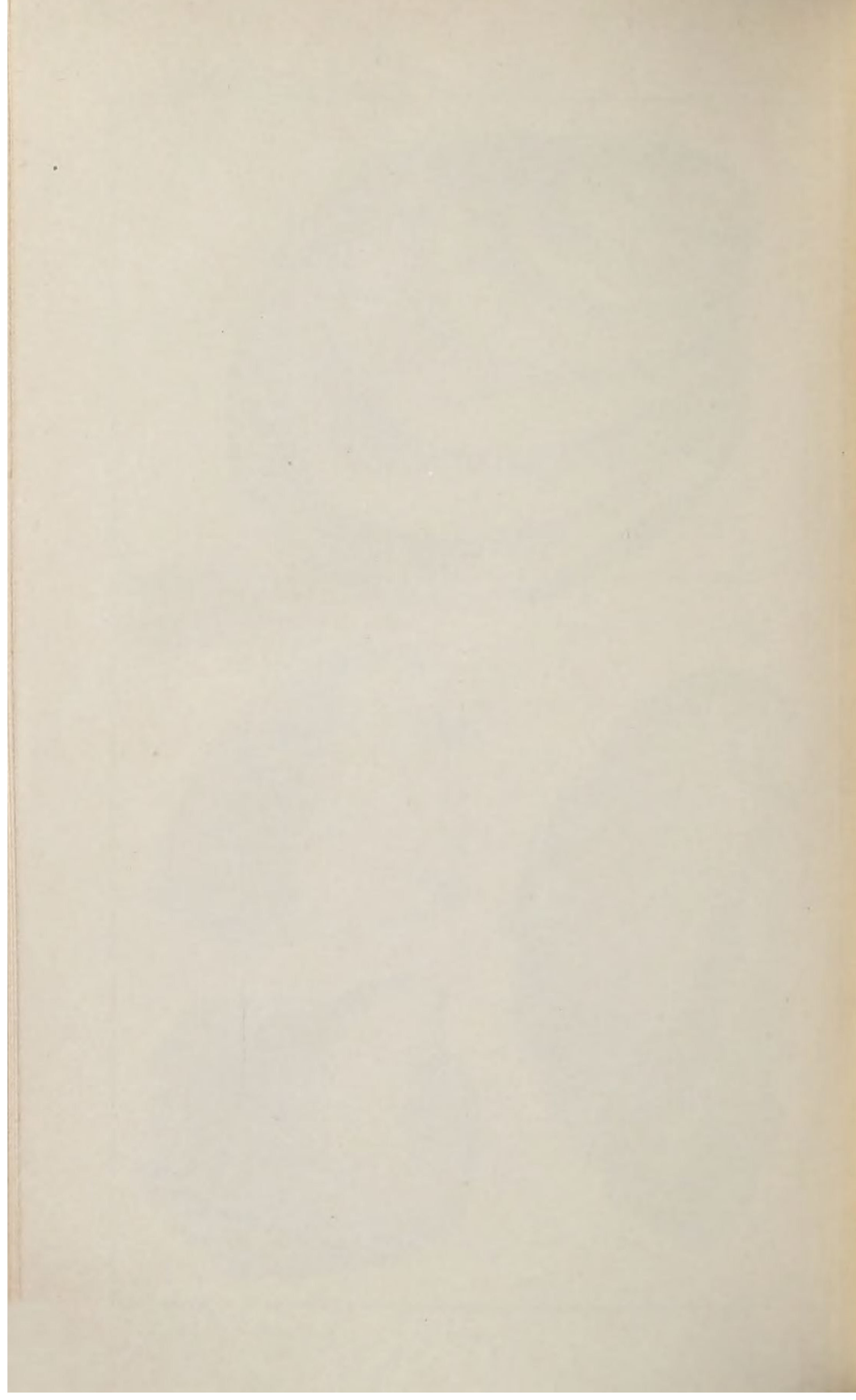
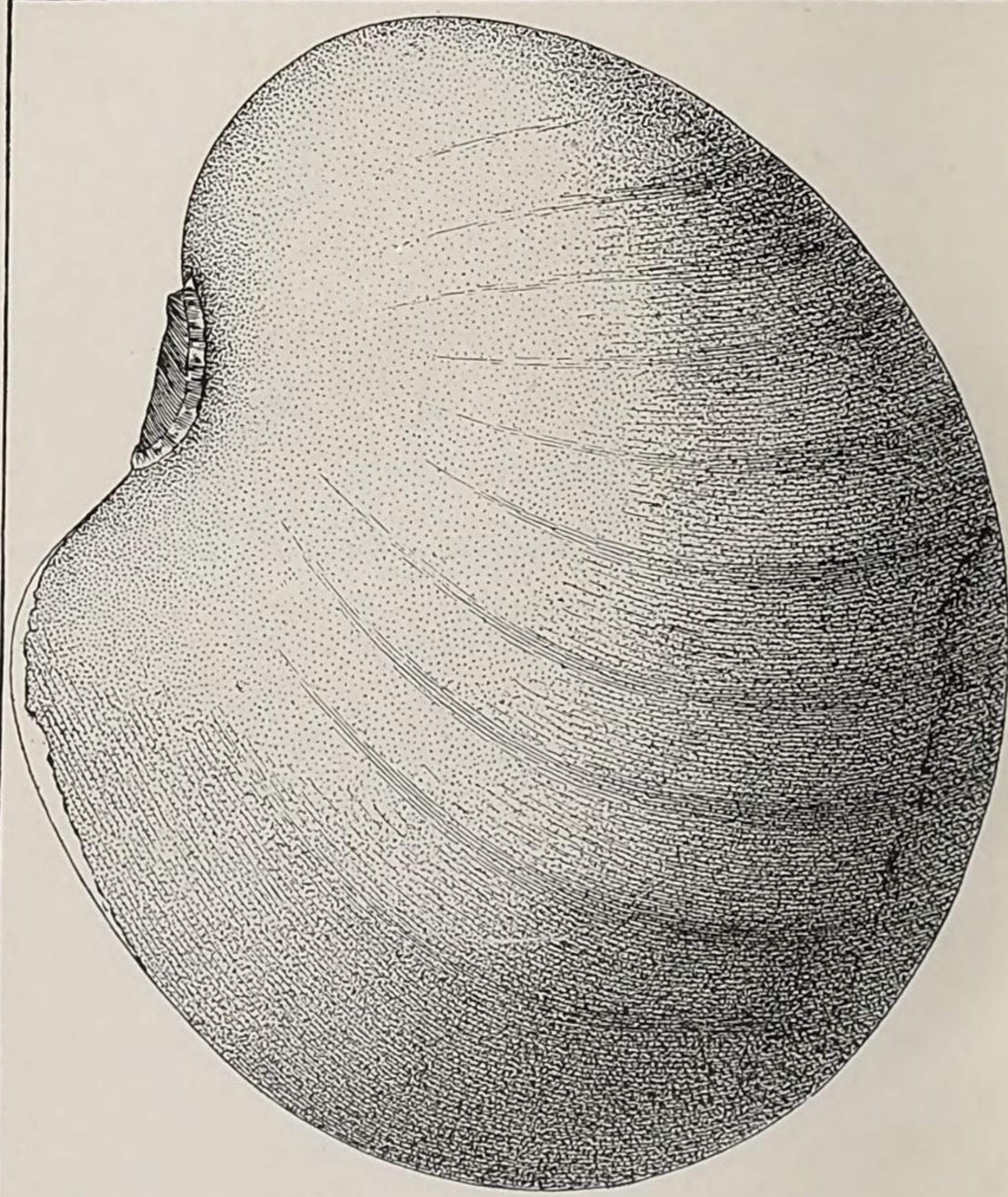
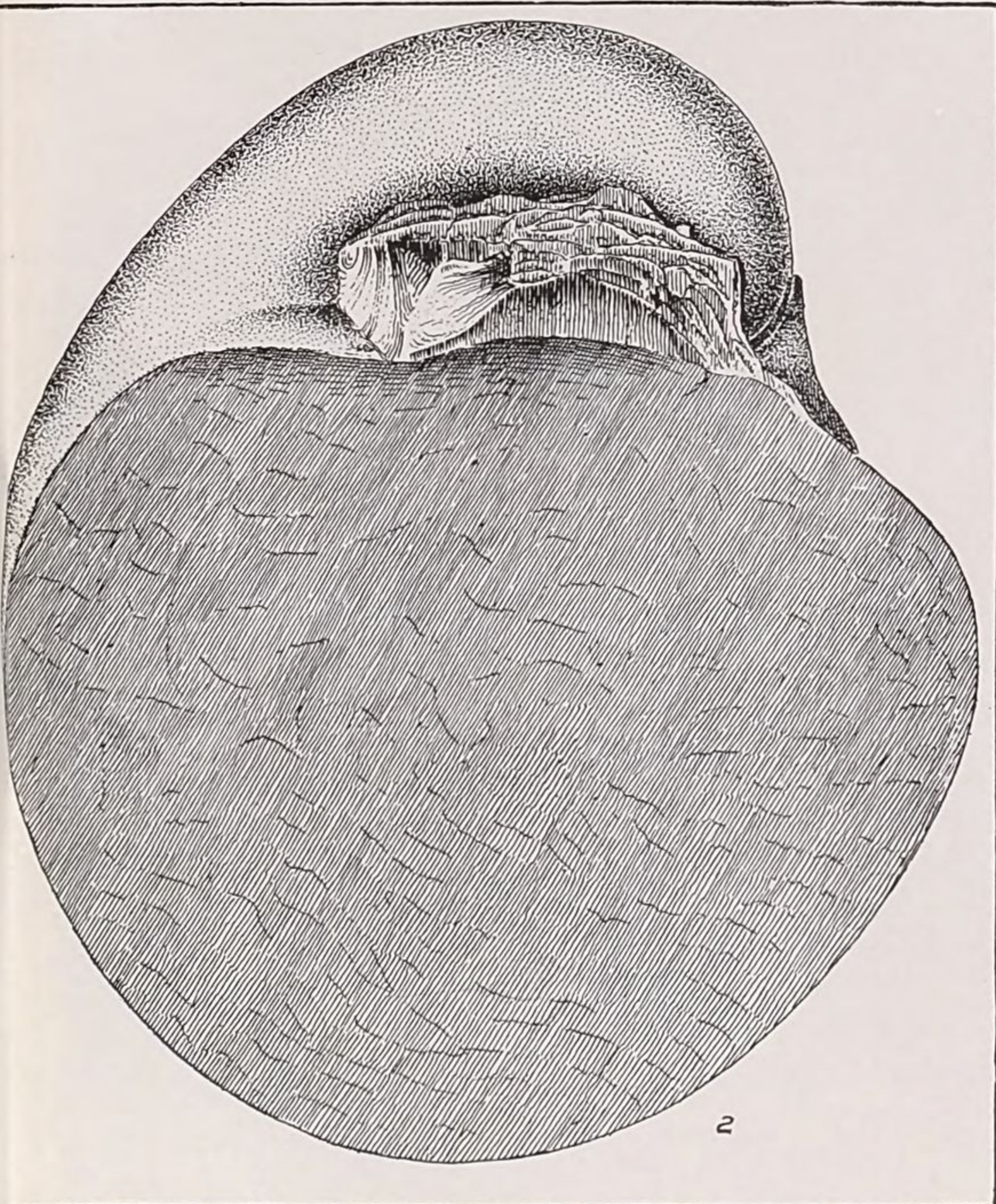


PLATE XVII.

PLATE XVII.

INOCERAMUS EXOGYROIDES M. & H.	83
Figs. 1, 2. Two views of an internal cast of the left valve (after Meek).	



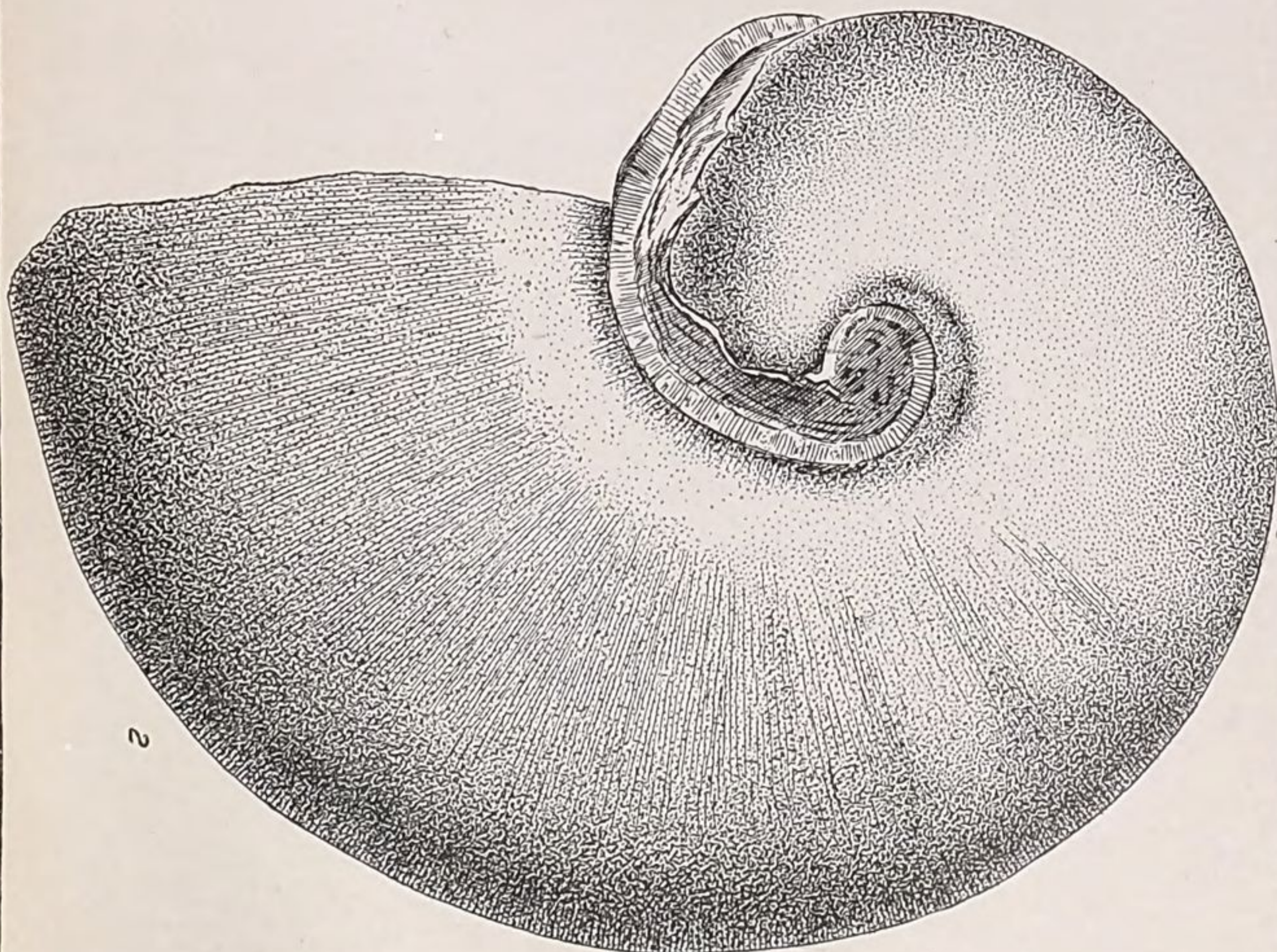
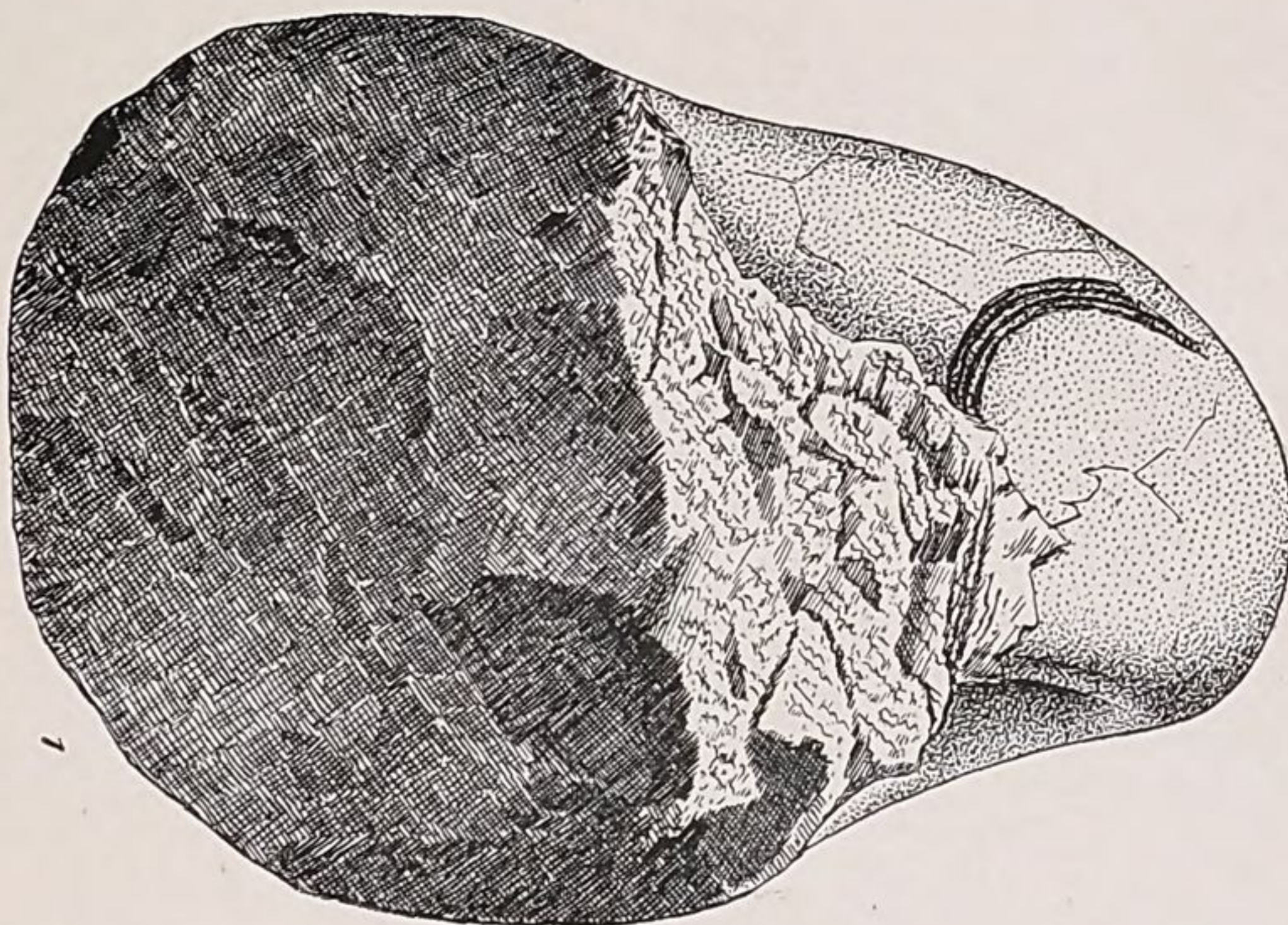


AVICULIDÆ.

PLATE XVIII.

PLATE XVIII.

INOCERAMUS UMBONATUS M. & H.....	Page 81
Fig. 1. Dorsal view of a cast of a left valve reduced in size (after Meek).	
2. Anterior view of a cast of a left valve, retaining portions of the fibrous layer of shell in the umbonal region (after Meek).	



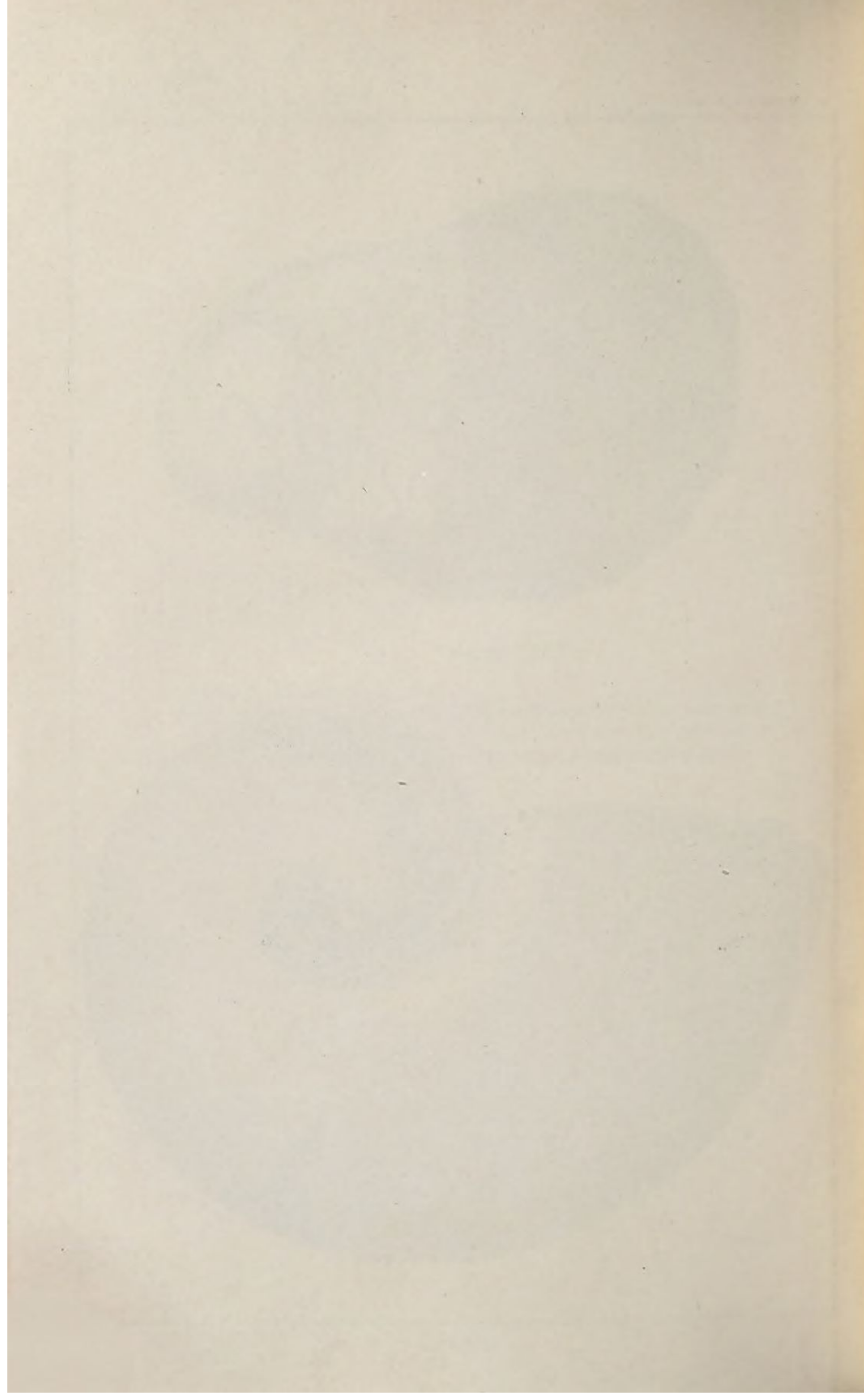


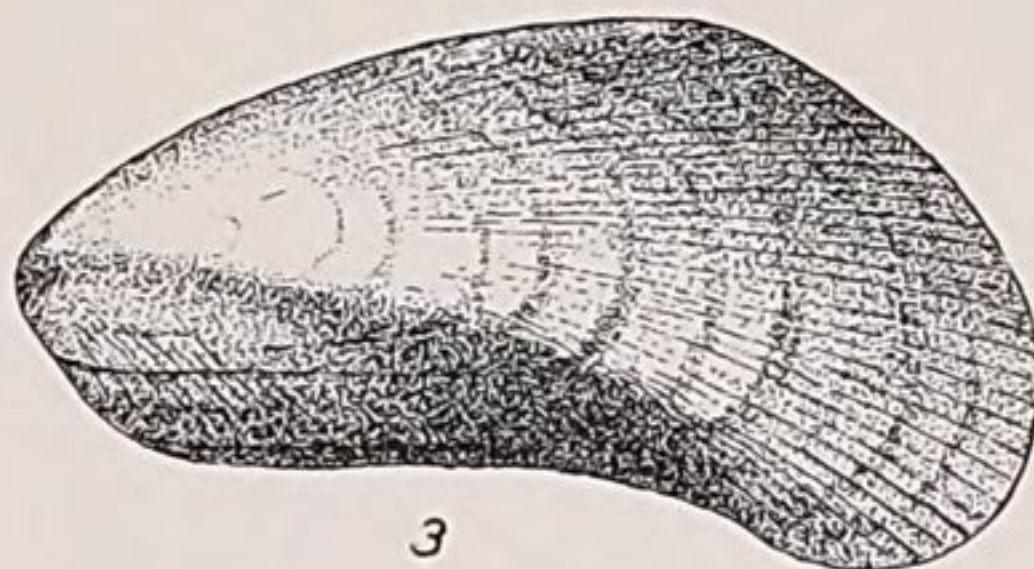
PLATE XIX.

PLATE XIX.

	Page.
TRIGONARCA OBLIQUA Meek	92
Fig. 1. Left valve of a short broad specimen, showing traces of radiating lines on the posterior region. (See other figures on Pl. xx.) Nat. Mus. Cat. Invert. Foss., 22869.	
TRIGONARCA DEPRESSA White.....	93
Fig. 2. Right valve of the type specimen. Nat. Mus. Cat. Invert. Foss., 8645.	
MODIOLA (BRACHYDONTES) MULTILINIGERA Meek.....	86
Fig. 3. Left valve (after White).	
PINNA PETRINA White.....	88
Fig. 4. Right valve of the type of <i>Pinna stvensoni</i> . (See Pl. xx, Fig. 1.) Nat. Mus. Cat. Invert. Foss., 8101.	



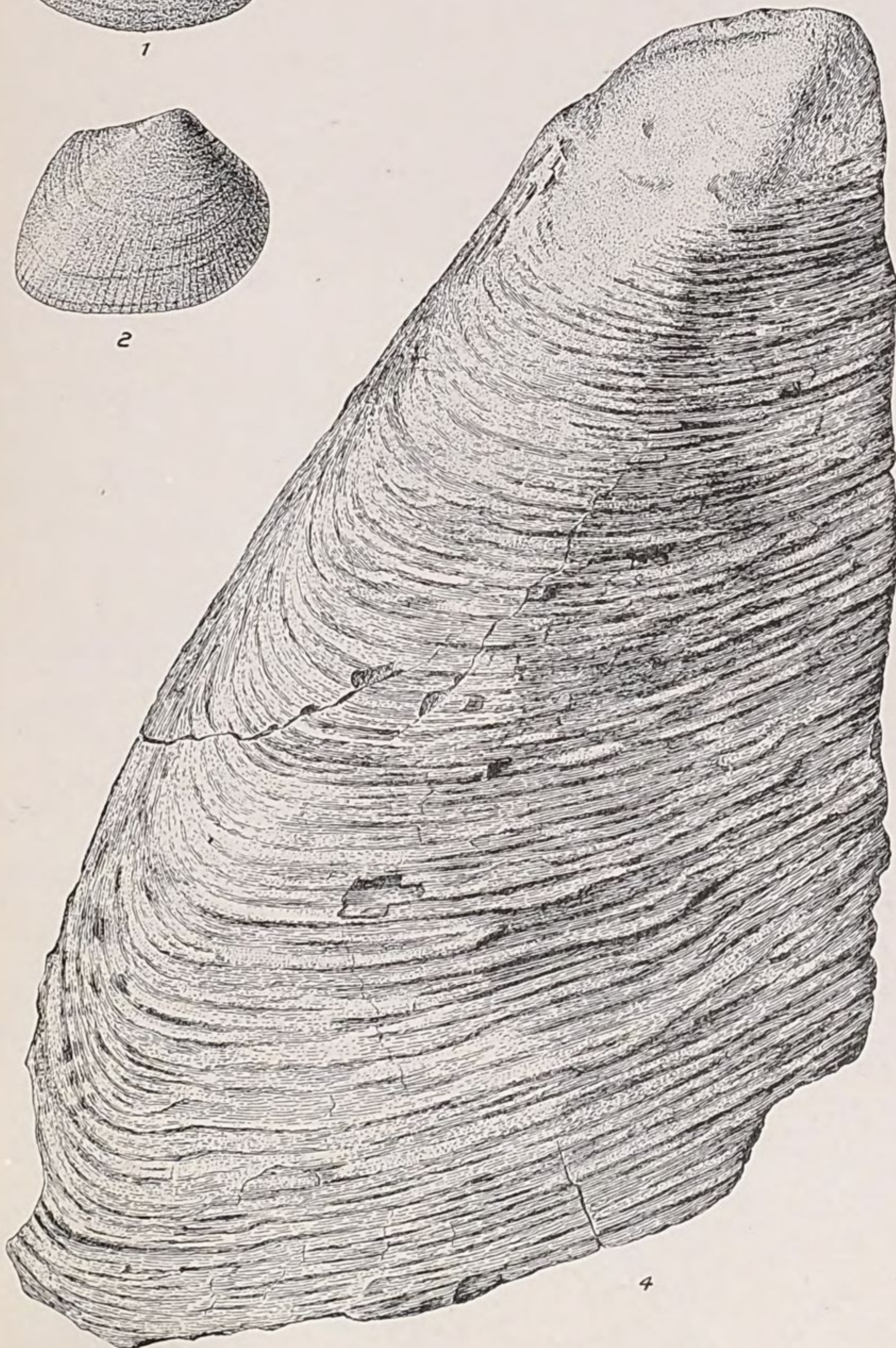
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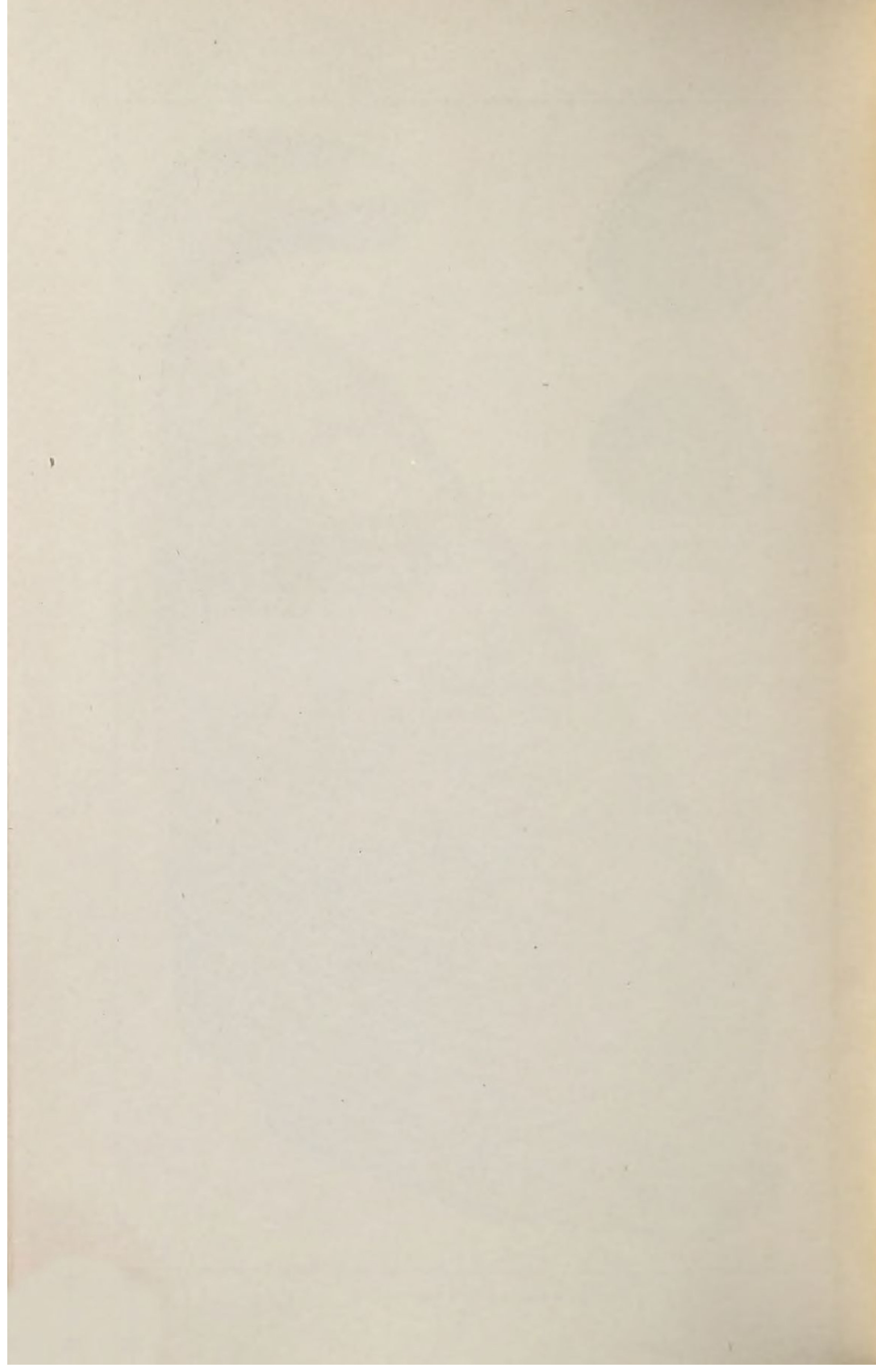
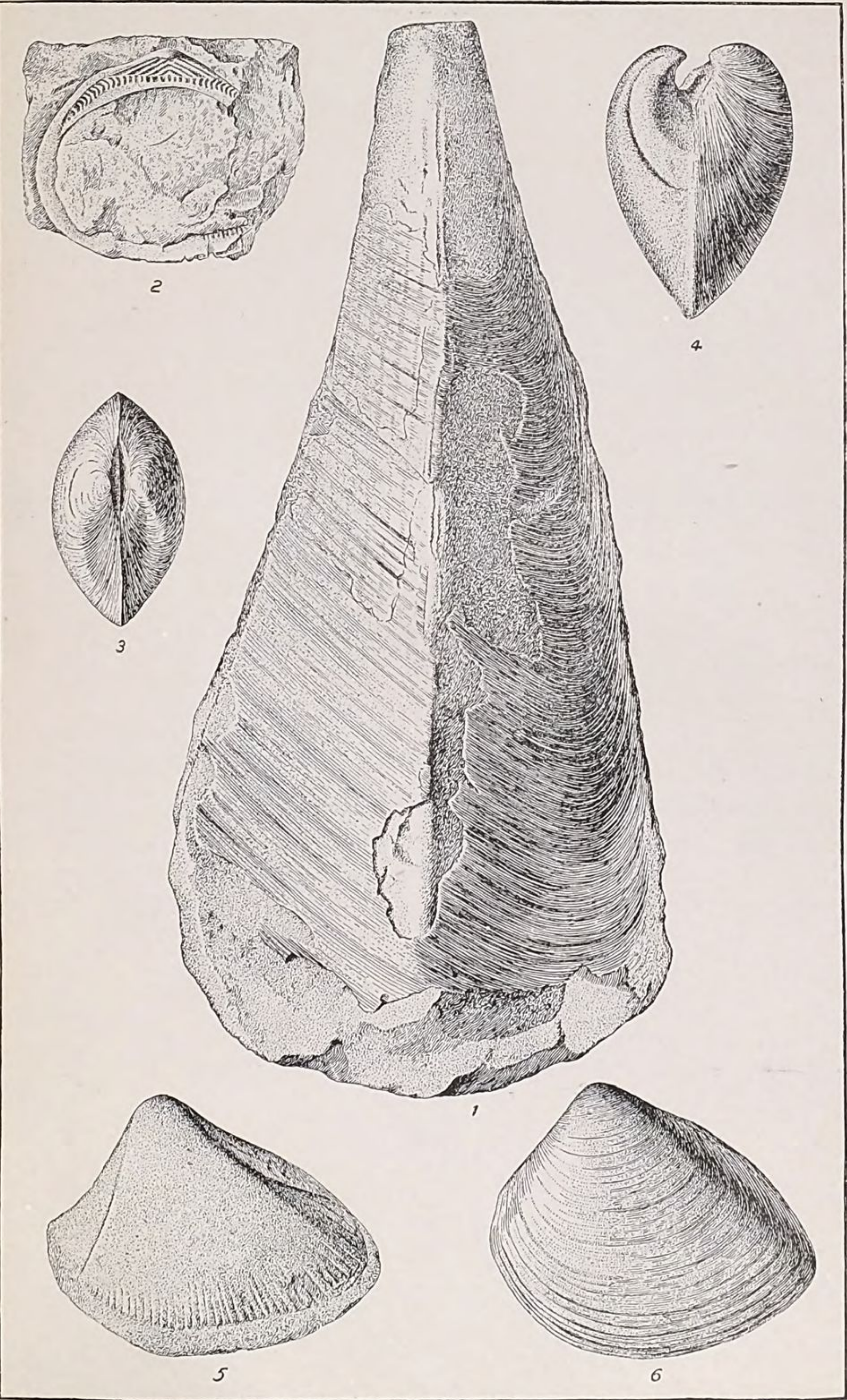


PLATE XX.

PLATE XX.

	Page.
PINNA PETRINA White.....	88
Fig. 1. Left valve of the type specimen. (See Pl. XIX, Fig. 4.)	
Nat. Mus. Cat. Invert. Foss., 8640.	
TRIGONARCA OBLIQUA Meek.....	92
Nat. Mus. Cat. Invert. Foss., 22869.	
Fig. 2. Hinge of right valve.	
3. Dorsal view of a small specimen.	
4. Posterior view of a larger example with shell removed from left valve, showing the imprint of the ridge that borders the muscular scar.	
5. Left side view of the same specimen.	
6. Left valve of a large specimen. (See Fig. 1 on Pl. XIX.)	



PINNIDÆ AND ARCIDÆ.

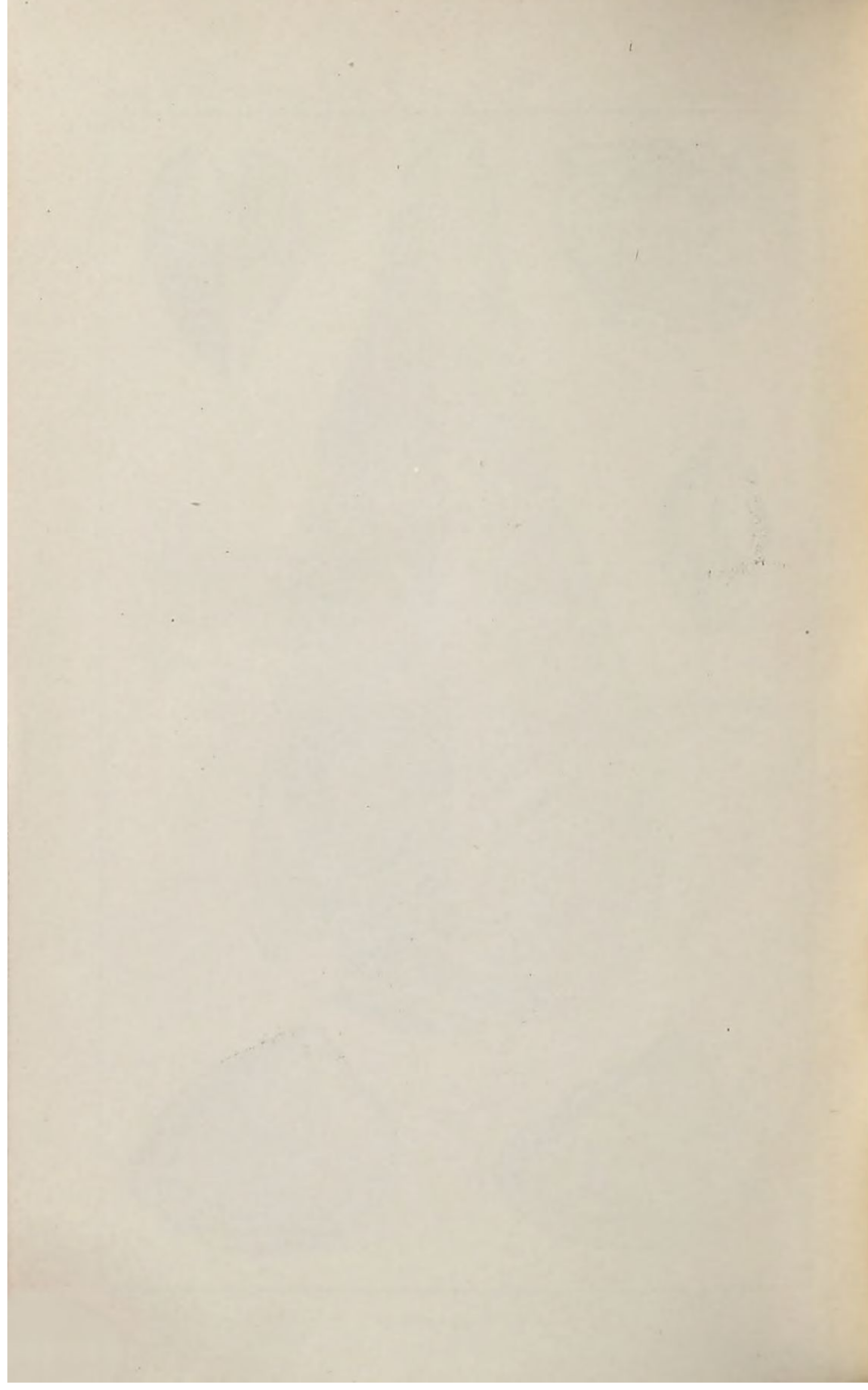
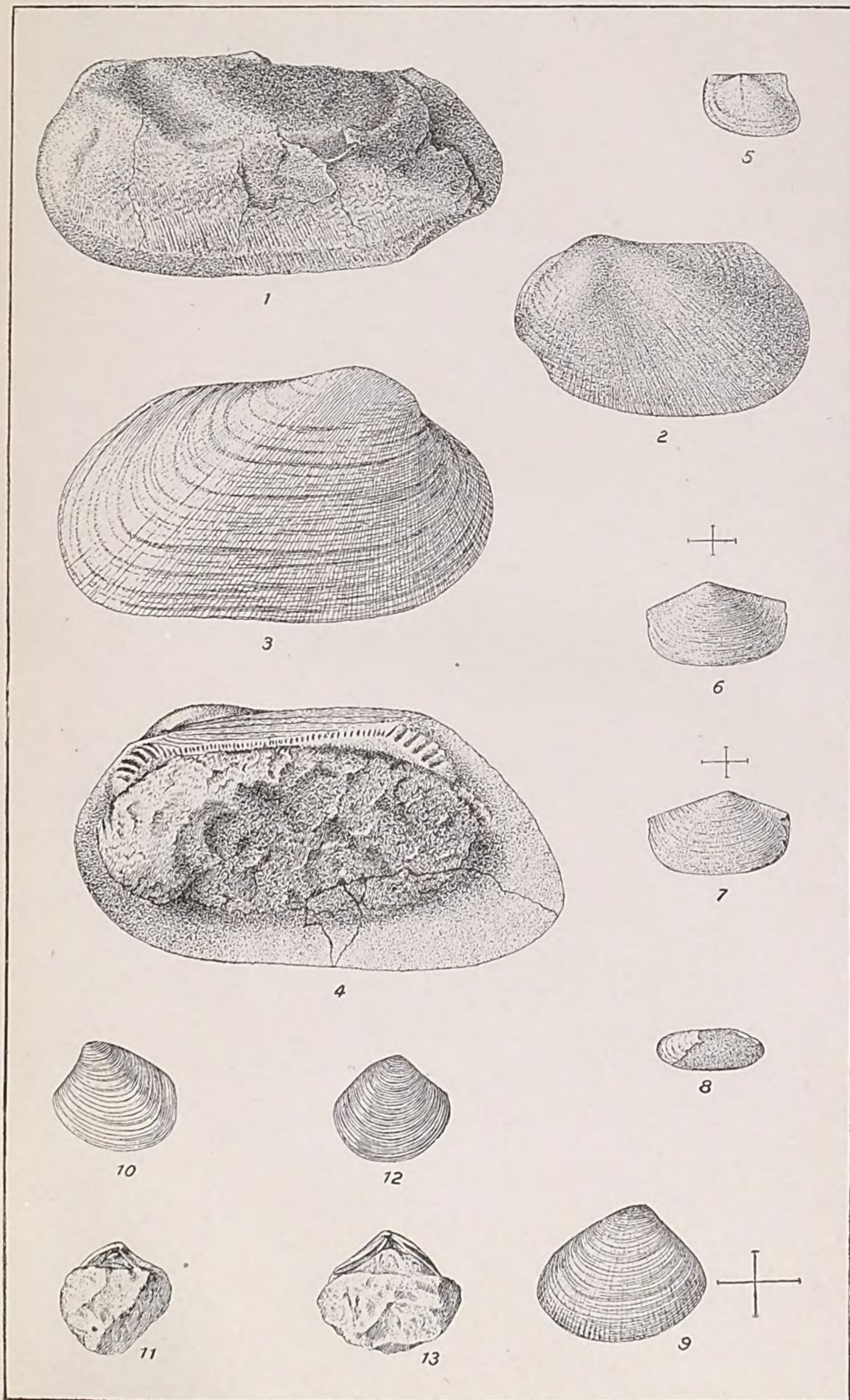


PLATE XXI.

PLATE XXI.

BARBATIA MICRONEMA Meek.....	Page 89
Fig. 1. Left side view of Meek's type of <i>Trapezium micronema</i> . Nat. Mus. Cat. Invert. Foss., 7846.	
2. Cast of a small broader left valve retaining the surface markings. This is like the types of <i>Barbatia coalvillensis</i> , and is from the same locality. Nat. Mus. Cat. Invert. Foss., 22871.	
3. Right valve of a rather broad specimen believed to belong to this species from Denton county, Texas.	
4. Interior view showing hinge of a more elongate right valve from the same locality. Nat. Mus. Cat. Invert. Foss., 22870.	
NEMODON SULCATINUS E. & S.?.....	91
Fig. 5. Cast of left valve enlarged two diameters. Nat. Mus. Cat. Invert. Foss., 22872.	
YOLDIA SUBELLIPTICA n. sp	94
Figs. 6, 7. Opposite views of the type specimen enlarged. Nat. Mus. Cat. Invert. Foss., 22873.	
SOLEMYA? OBSCURA n. sp.....	95
Fig. 8. Cast of left (?) valve retaining portions of the shell. Nat. Mus. Cat. Invert. Foss., 22874.	
NUCULA COLORADOENSIS n. sp	94
Fig. 9. View of right valve enlarged. Nat. Mus. Cat. Invert. Foss., 22876.	
CRASSATELLA EXCAVATA n. sp	96
Nat. Mus. Cat. Invert. Foss., 22875.	
Fig. 10. Left valve of the best preserved type.	
11. Hinge of another left valve.	
12. Right valve slightly distorted by pressure.	
13. Hinge of same.	

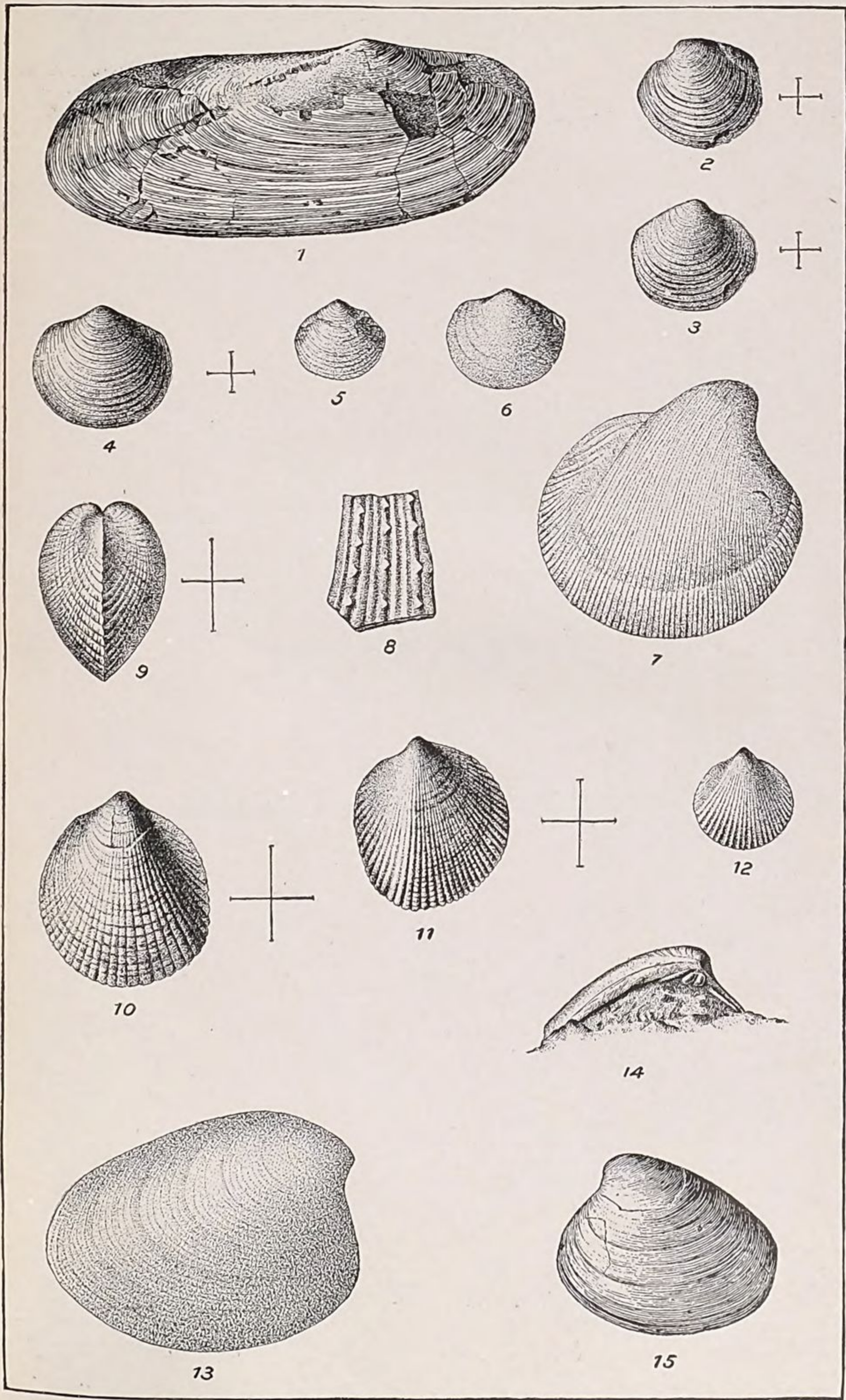


ARCIDÆ, NUCULIDÆ, SOLEMYIDÆ AND CRASSATELLIDÆ.

PLATE XXII.

PLATE XXII.

	Page.
UNIO sp	95
Fig. 1. A small right valve. Nat. Mus. Cat. Invert. Foss., 22877.	
LUCINA JUVENIS n. sp	98
Nat. Mus. Cat. Invert. Foss., 22878. Figs. 2, 3. Opposite views of one of the types, enlarged. 4. Left valve of another more convex specimen, enlarged.	
LUCINA SUBUNDATA H. & M. ?	97
Nat. Mus. Cat. Invert. Foss., 22879. Fig. 5. Small right valve retaining portions of the natural surface. 6. Left side view of one of the largest casts.	
CARDIUM TRITE White	100
Fig. 7. Cast of right valve (after White). 8. Portion of the surface, magnified (after White).	
CARDIUM PAUPERCULUM Meek	99
Fig. 9. Anterior view of both valves, enlarged. Nat. Mus. Cat. Invert. Foss., 22880. 10. Left valve from Bear River city, Wyoming, enlarged. The surface is slightly eroded, so that the ribs appear unnaturally broad. Nat. Mus. Cat. Invert. Foss., 22881. 11. Right valve from Huerfano park, Colorado, enlarged. Nat. Mus. Cat. Invert. Foss., 22880. 12. Small right valve of broad variety from Coalville, Utah. Nat. Mus. Cat. Invert. Foss., 22882.	
CYRENA INFLEXA Meek	103
Fig. 13. Right valve of one of the types (after White).	
CYRENA AEQUILATERALIS Meek?	102
Fig. 15. A left valve doubtfully referred to the species. Nat. Mus. Ca. Invert. Foss., 22883. 14. Hinge of same.	



UNIONIDÆ, LUCINIDÆ, CARDIIDÆ AND CYRENIDÆ.

PLATE XXIII.

PLATE XXIII.

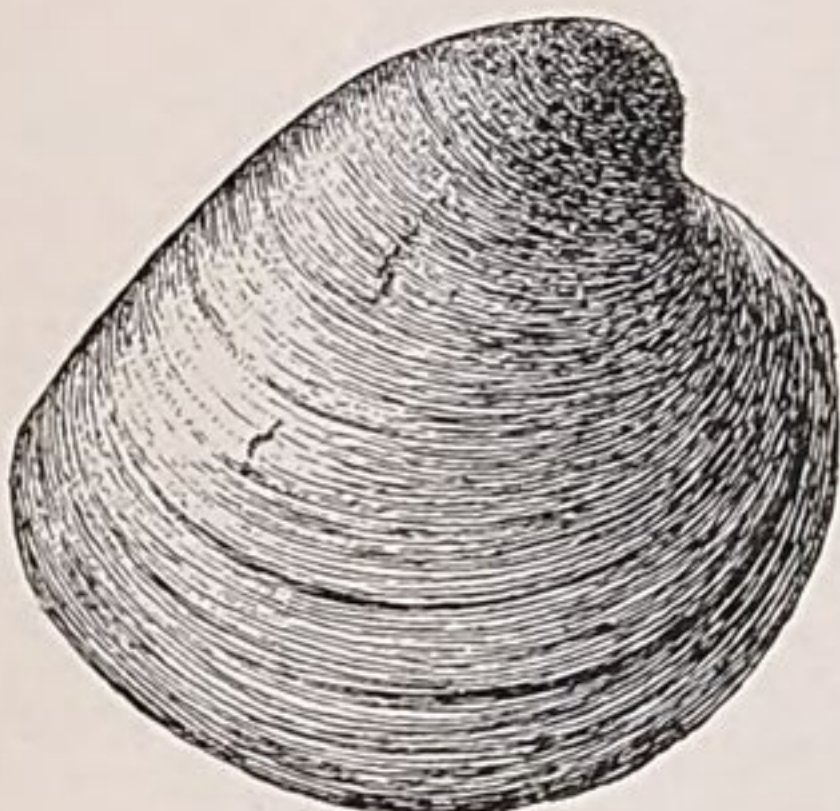
	Page.
CYRENA SECURIS Meek.....	101
Fig. 1. Left valve.	
Nat. Mus. Cat. Invert. Foss., 22884.	
2. Hinge of same.	
3. Right valve of specimen from southern Utah believed to belong to this species.	
Nat. Mus. Cat. Invert. Foss., 22885.	
CYRENA sp	102
Fig. 4. Right valve associated with specimen represented by Fig. 3.	
Nat. Mus. Cat. Invert. Foss., 22886.	
VENIELLA GONIOPHORA Meek.....	105
Fig. 5. Right side view of an internal cast (after Meek).	
VENIELLA MORTONI M. & H.....	104
Nat. Mus. Cat. Invert. Foss., 22887.	
Fig. 6. A small left valve.	
7. A small right valve.	
8. A large left valve.	
9. Hinge of same.	



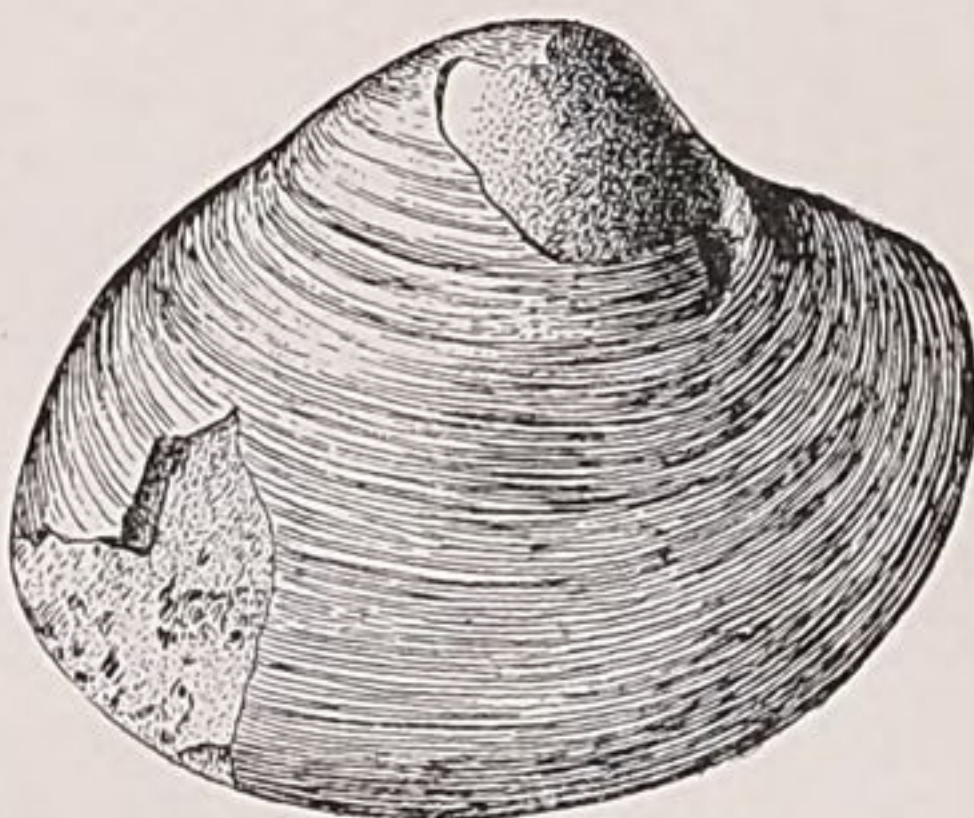
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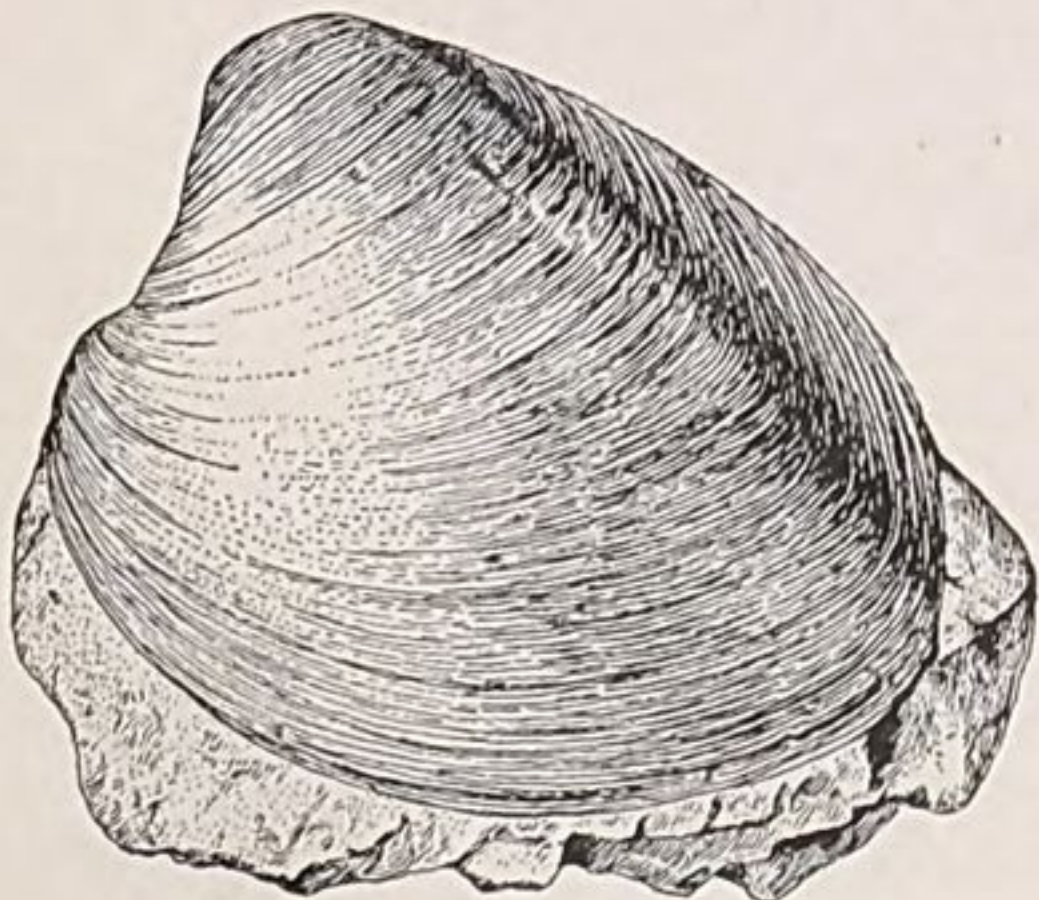
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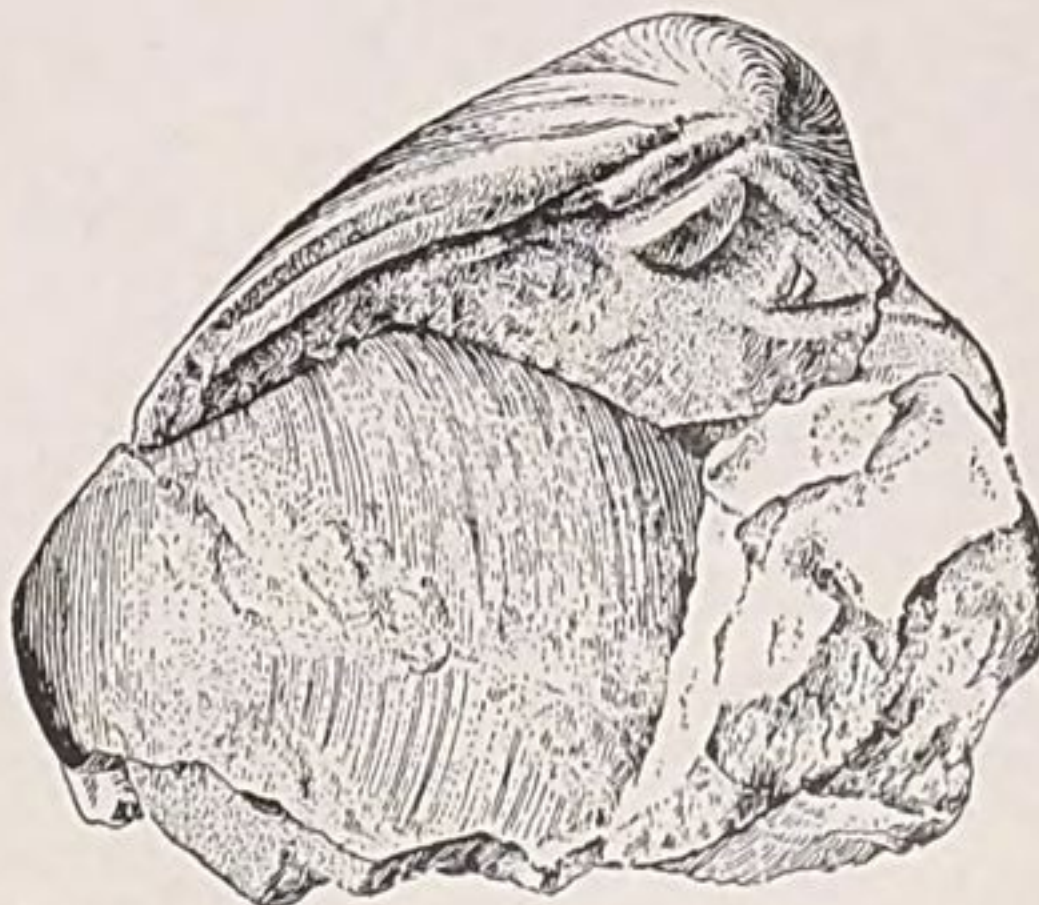
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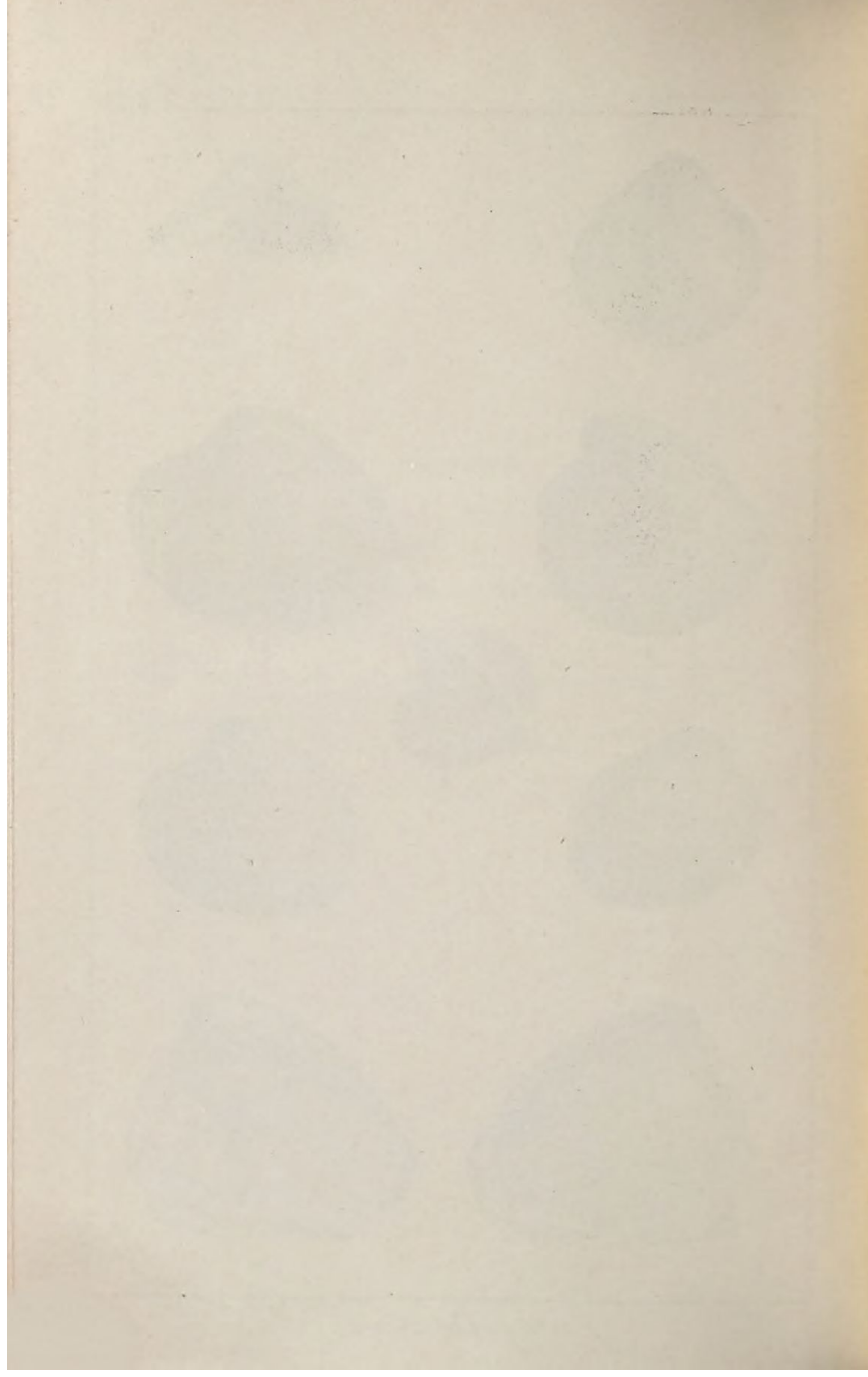
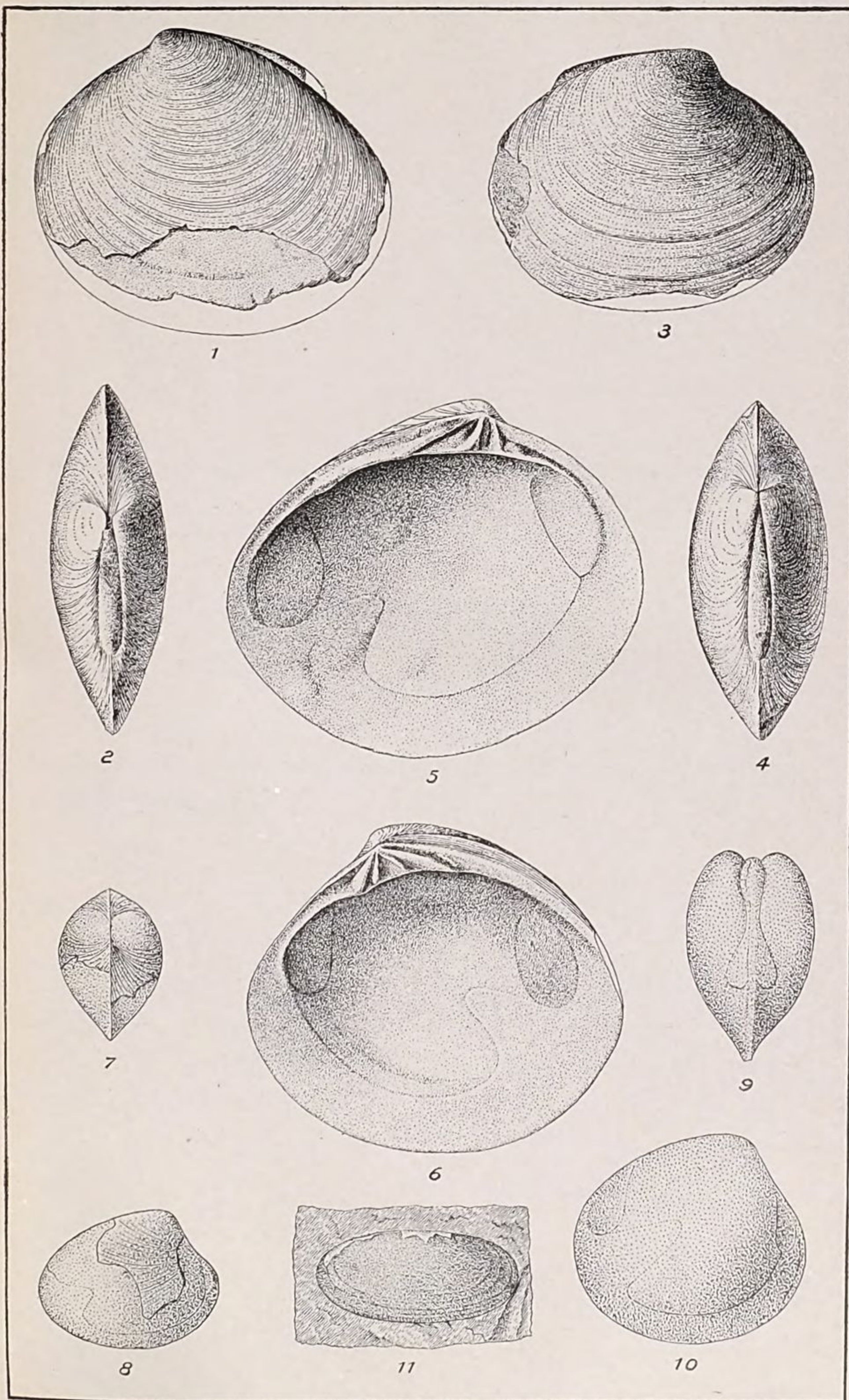


PLATE XXIV.

PLATE XXIV.

	Page
TAPES CYPRIMERIFORMIS n. sp.	106
Nat. Mus. Cat. Invert. Foss., 22890.	
Fig. 1. Right valve of a large specimen.	
2. Dorsal view of same.	
3. Left valve of a more convex example.	
4. Dorsal view of same.	
5. Interior of left valve, from gutta-percha mold of natural cast supplemented by specimens of the shell.	
6. Interior of right valve obtained in same manner as preceding.	
CALLISTA (APHRODINA?) TENUIS H. & M.	109
Figs. 7, 8. Two views of one of the types (after Meek).	
CALLISTA (DOSINIOPSIS?) ORBICULATA H. & M.	108
Figs. 9, 10. Two views of one of the types (after Meek).	
LEGUMEN? sp.	107
Fig. 11. Cast of left valve.	
Nat. Mus. Cat. Invert. Foss., 22891.	



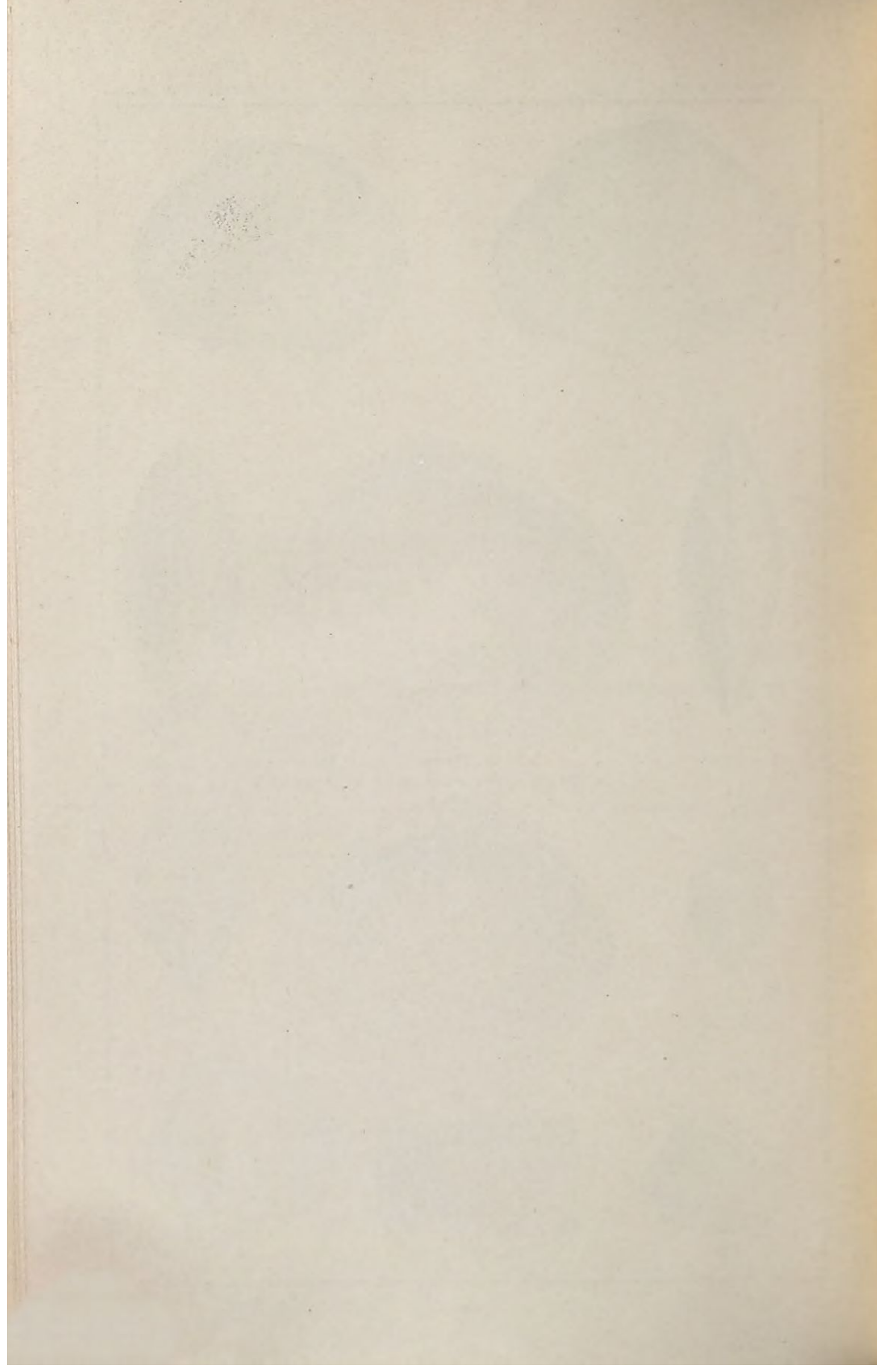
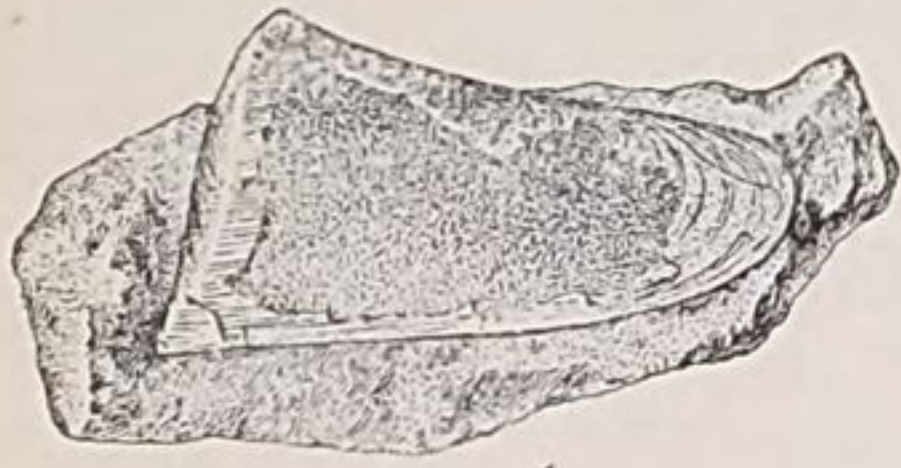


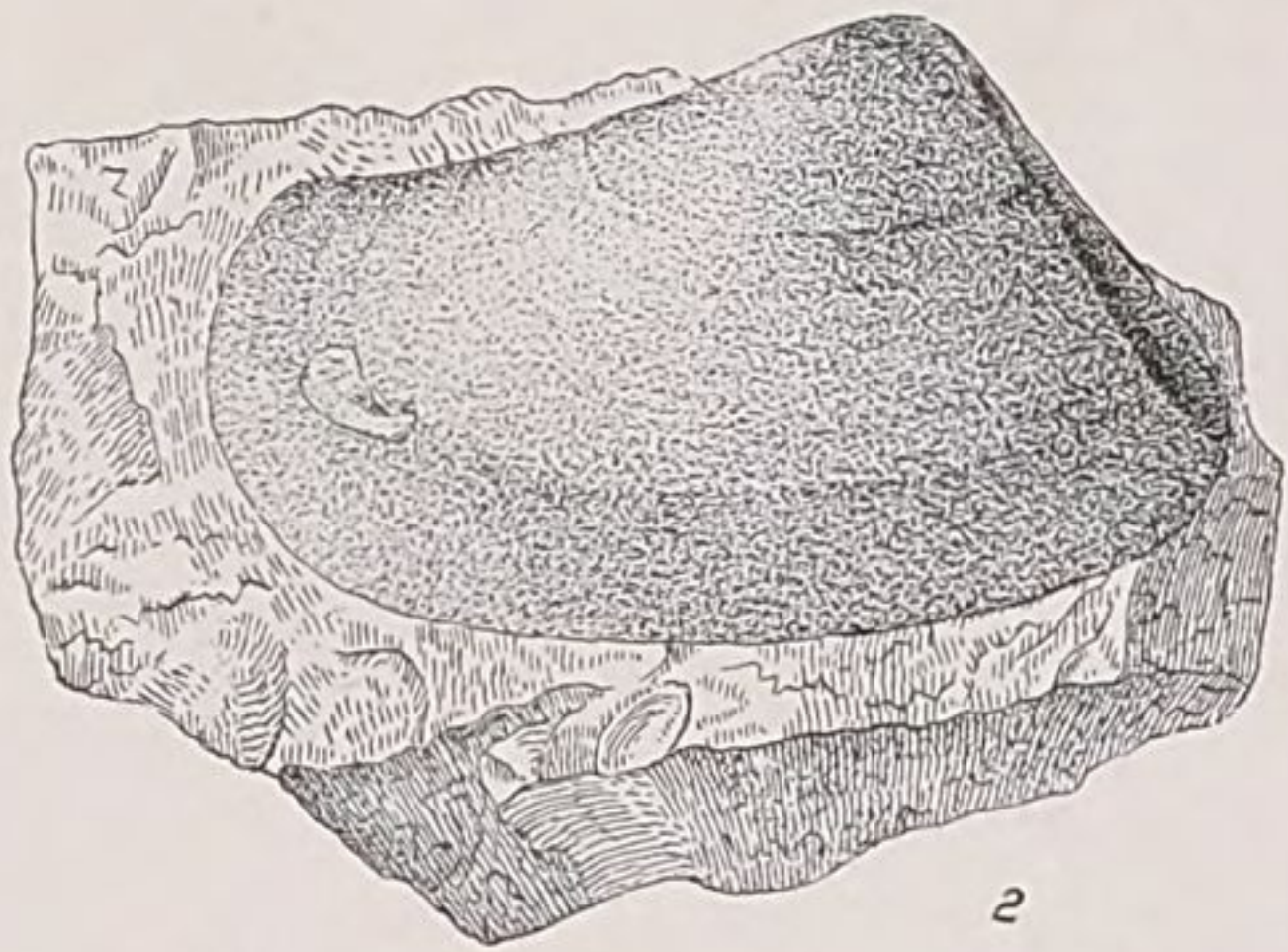
PLATE XXV.

PLATE XXV.

	Page
DONAX CUNEATA n. sp.....	110
Fig. 1. Cast of right valve retaining small portions of the shell. Nat. Mus. Cat. Invert. Foss., 22888.	
DONAX OBLONGA n. sp.....	111
Fig. 2. Cast of a large left valve. Nat. Mus. Cat. Invert. Foss., 22889.	
TELLINA MODESTA Meek.....	111
Fig. 3. Cast of an elongate right valve that retains some of the surface markings. Nat. Mus. Cat. Invert. Foss., 22892.	
TELLINA (PALÆOMÆRA) WHITEI n. sp.....	112
Nat. Mus. Cat. Invert. Foss., 22893. Fig. 4. Right valve of the larger type. 5. Left valve of same showing pallial sinus where the shell is broken. 6. Left valve of another specimen. 7. Dorsal view of same.	
TELLINA ISONEMA Meek.....	113
Fig. 8. Copy of Meek's original figure.	
TELLINA ? SUBALATA Meek.....	113
Fig. 9. Copy of Meek's original figure.	
SILQUA HUERFANENSIS n. sp.....	114
Nat. Mus. Cat. Invert. Foss., 22894. Fig. 10. Cast of right valve retaining portions of the shell and showing the pallial sinus. Fig. 11. Left valve of another specimen.	
PHARELLA ? PEALEI Meek.....	115
Figs. 12, 13. Two views of the type specimen (after White).	



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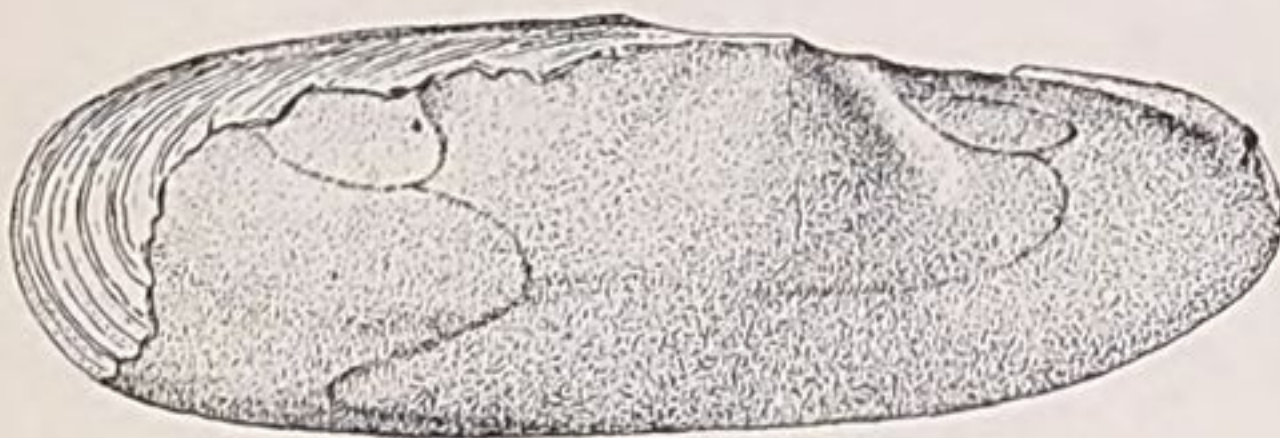
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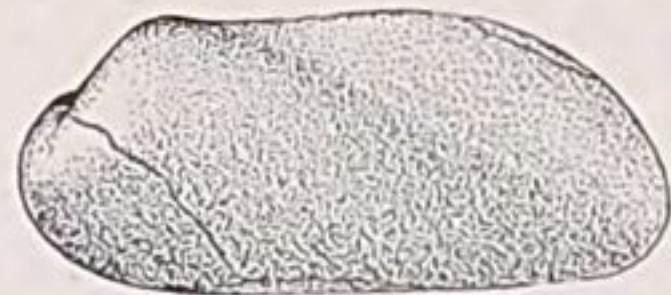
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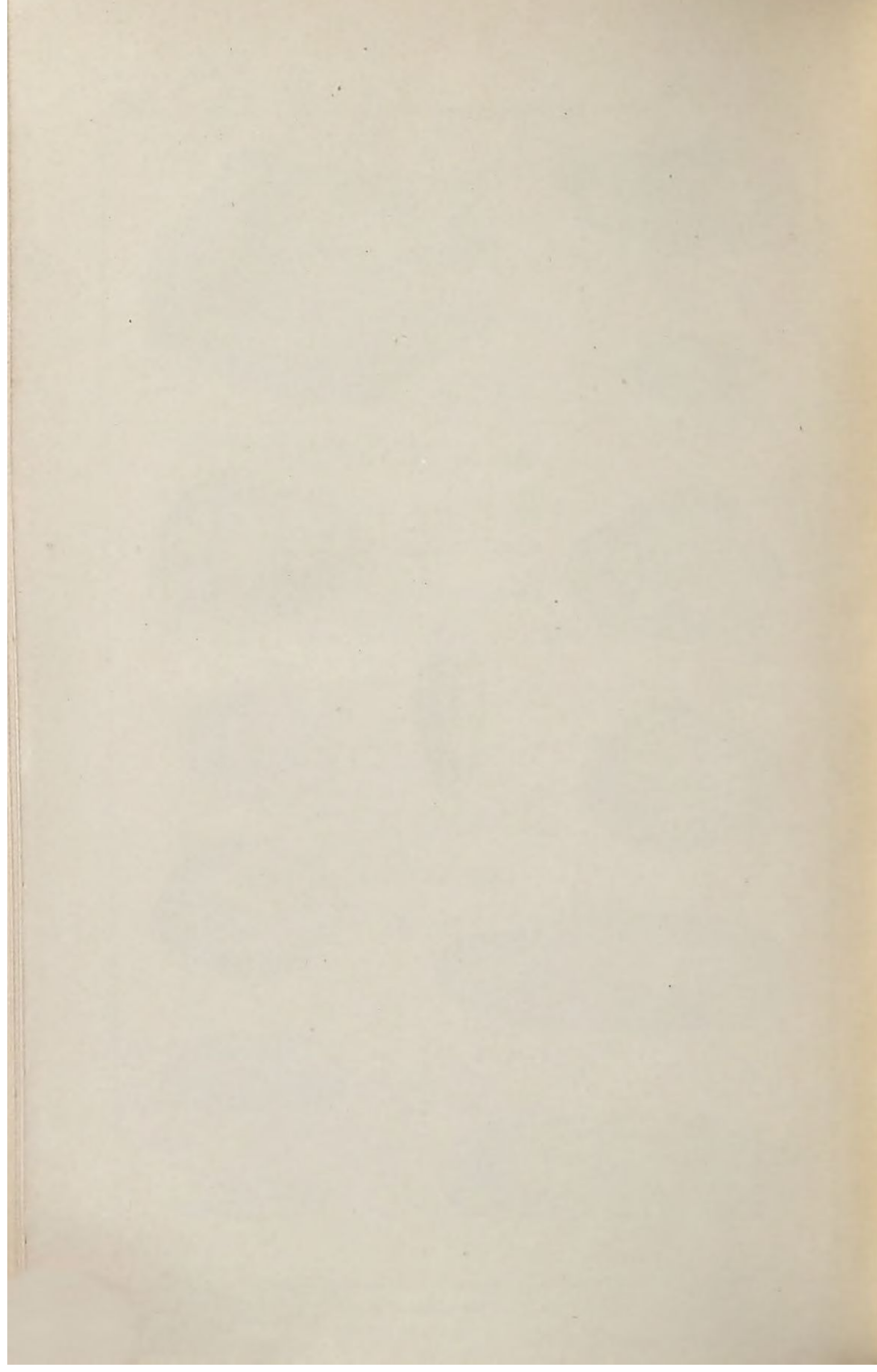


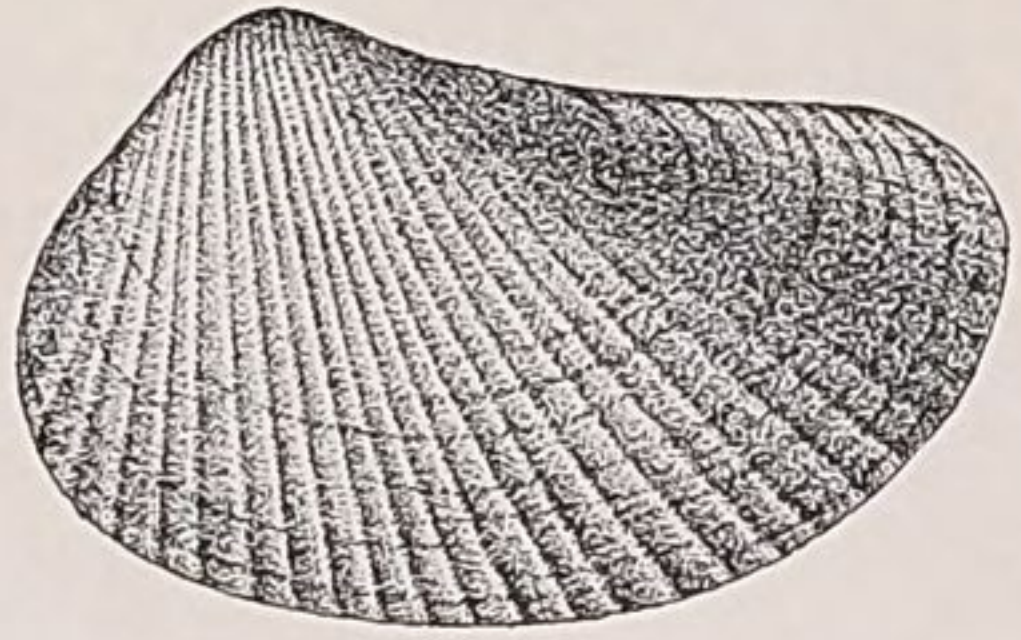
PLATE XXVI.

PLATE XXVI.

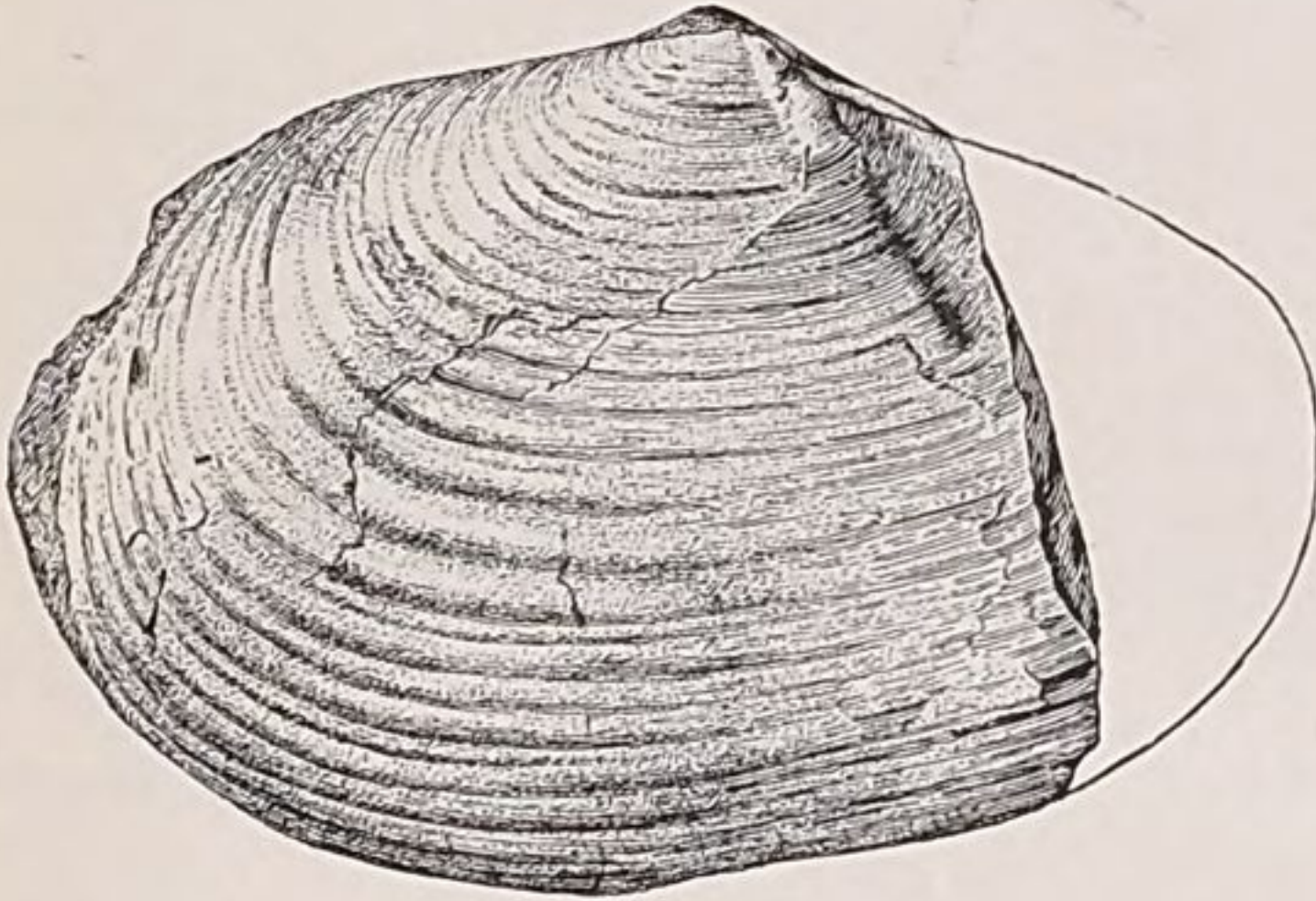
	Page.
PHOLADOMYA PAPYRACEA M. & H.....	116
Fig. 1. Left valve of type specimen (after Meek).	
PHOLADOMYA COLORADOENSIS n. sp.....	116
Fig. 2. Left valve of a small specimen with the surface partly restored from other examples.	
Nat. Mus. Cat. Invert. Foss., 22895.	
ANATINA LINEATA n. sp.....	117
Nat. Mus. Cat. Invert. Foss., 22896.	
Fig. 3. Left valve of a large broken specimen.	
4. A small right valve from a gutta-percha impression of a natural mold.	
LIOPISTHA (PSILOMYA) MEEKI White.....	118
Fig. 5. Left valve retaining portions of the shell and showing faint punctate radiating lines.	
Nat. Mus. Cat. Invert. Foss., 22897.	
6. Dorsal view of another specimen to show convexity of the valves.	
7. Right valve of one of the type specimens.	
Nat. Mus. Cat. Invert. Foss., 8647.	
LIOPISTHA (PSILOMYA) CONCENTRICA n. sp.....	119
Nat. Mus. Cat. Invert. Foss., 22898.	
Fig. 8. Left valve.	
9. Dorsal view of same.	
10. Right valve.	
LIOPISTHA (PSILOMYA) ELONGATA n. sp.....	119
Nat. Mus. Cat. Invert. Foss., 22899.	
Fig. 11. Left valve.	
12. Right valve.	



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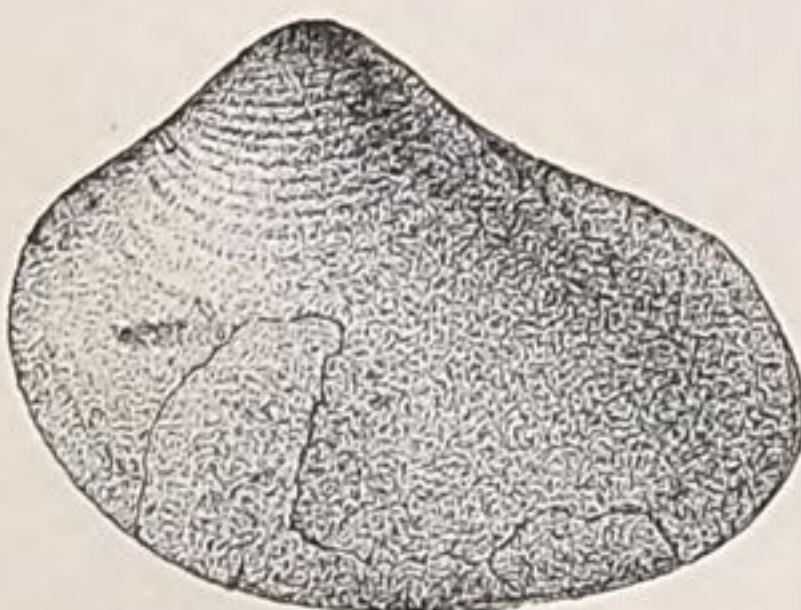
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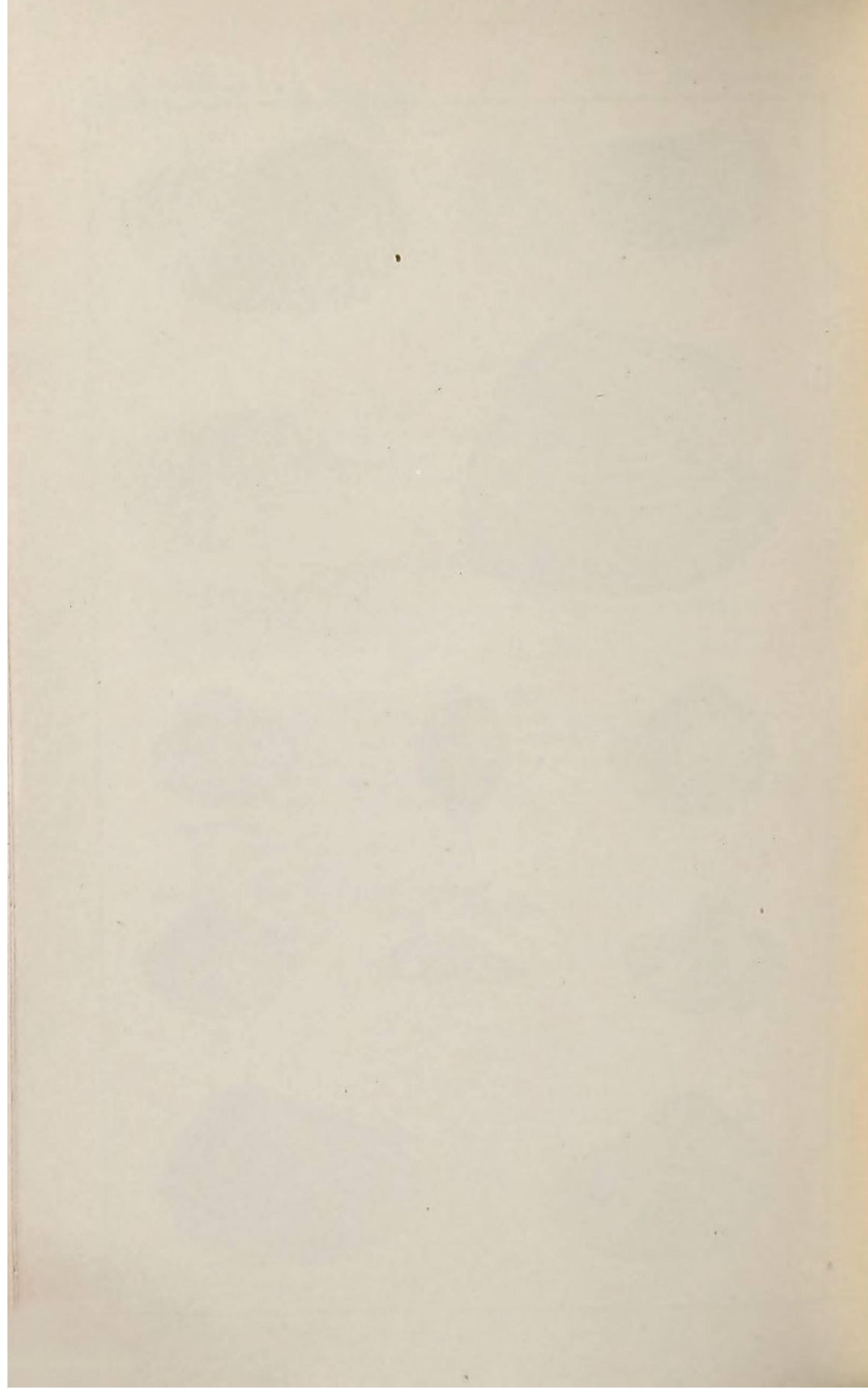


PLATE XXVII.

PLATE XXVII.

	Page.
PARAPHOLAS SPHENOIDEUS White.....	125
Figs. 1, 2. Two views of one of the type specimens (after White).	
CORBULA NEMATOPHORA Meek	124
Figs. 3, 4. Right valves of the ordinary size (after White).	
CORBULA KANABENSIS n. sp	125
Fig. 5. Left valve.	
Nat. Mus. Cat. Invert. Foss., 22900.	
6. Right valve.	
CORBULA SUTRIGONALIS M. & H. ?.....	123
Nat. Mus. Cat. Invert. Foss., 22901.	
Fig. 7. Left valve with portion of the surface restored.	
8. Small right valve.	
MACTRA EMMONSI Meek	121
Nat. Mus. Cat. Invert. Foss., 22902 and 22903.	
Fig. 9. Small right valve from Huerfano park, Colorado.	
10, 12. Two views of a larger left valve from same place.	
11. Cast of left valve from Coalville, Utah.	
13. Cast of right valve from Huerfano park, Colorado, showing pallial sinus.	
MACTRA HUERFANENSIS n. sp	122
Nat. Mus. Cat. Invert. Foss., 22904.	
Fig. 14. Cast of right valve showing pallial line.	
15. Cast of a more elongate right valve retaining portions of the shell.	
MACTRA (CYMBOPHORA) UTAHENSIS Meek	120
Fig. 16. Cast of a right valve (after Meek).	
17. Cast of another right valve differing in outline (after Meek).	



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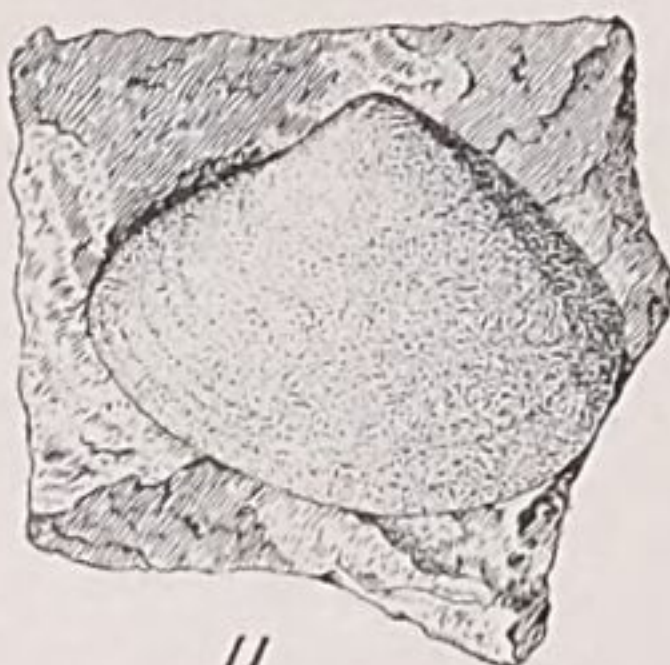
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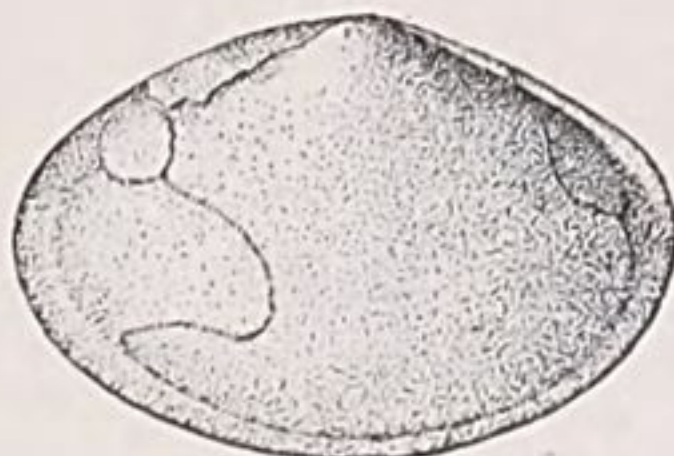
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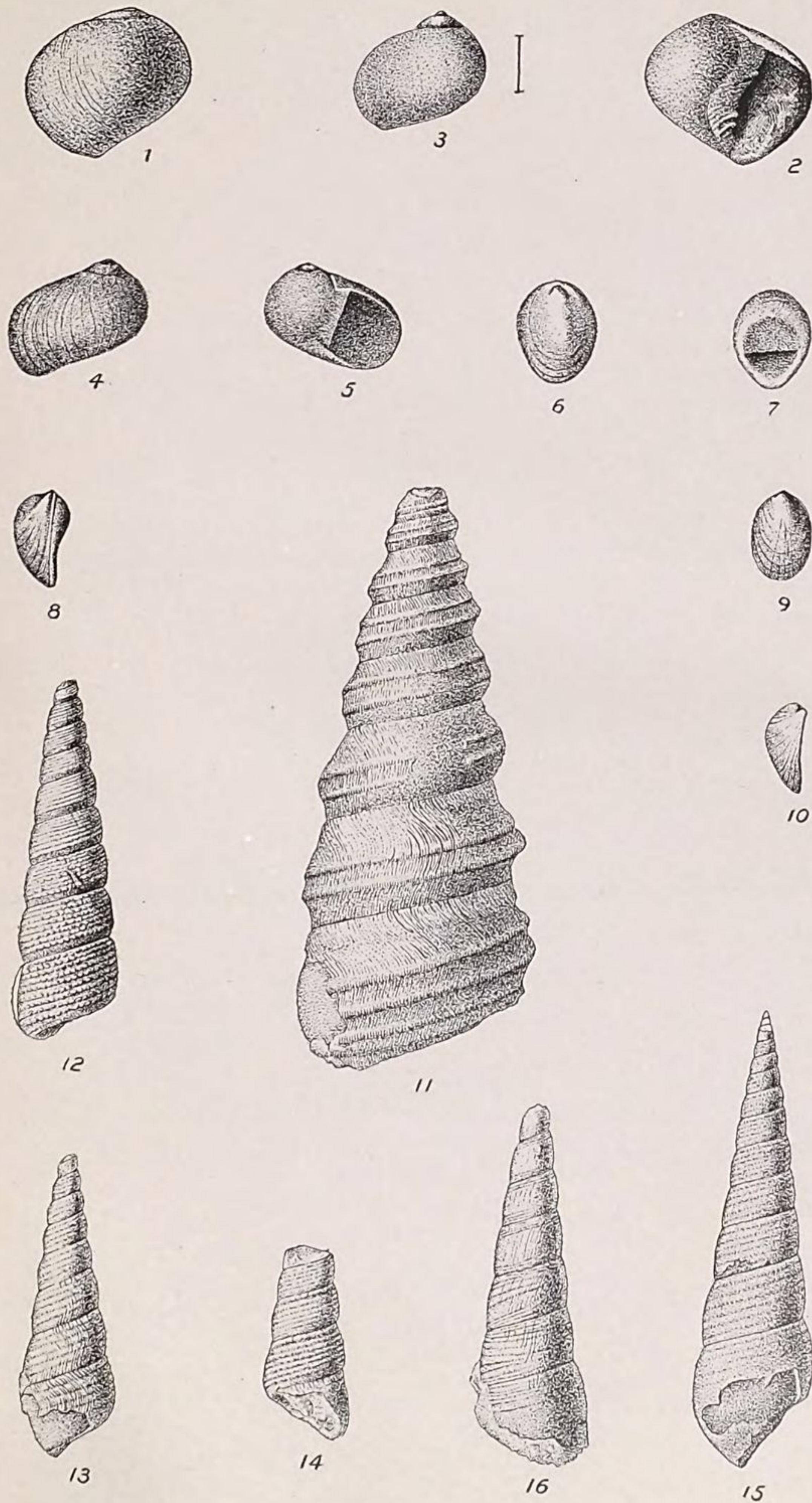


17

PLATE XXVIII.

PLATE XXVIII.

	Page.
NERITINA PISUM Meek.....	127
Fig. 1. Dorsal view of Meek's type specimen, enlarged.	
2. Aperture view of same.	
Nat. Mus. Cat. Invert. Foss., 7883.	
3. Dorsal view of the type of <i>Neritina pisiformis</i> (after White).	
NERITINA INCOMPTA White	128
Figs. 4, 5. Opposite views of the type specimen (after White).	
NERITINA (VELATELLA) PATELLIFORMIS Meek.....	128
Figs. 6, 7, 8. Three views of one of the type specimens (after White).	
9, 10. Two views of the type of the variety <i>weberensis</i> (after White).	
GLAUCONIA COALVILLENSIS Meek	132
Fig. 11. Dorsal view of an example from southern Utah. (See Pl. XIX.)	
Nat. Mus. Cat. Invert. Foss., 8249.	
TURRITELLA WHITEI n. sp.....	130
Fig. 12. Dorsal view of an average specimen from Upper Kanab, Utah.	
Nat. Mus. Cat. Invert. Foss., 22905.	
Figs. 13, 14, 15. Three specimens from Huerfano park, Colorado. Nos. 13 and 15 have the outer surface of the shell somewhat exfoliated. The revolving ridges on No. 14 are more distinctly nodose than the figure indicates.	
Nat. Mus. Cat. Invert. Foss., 22906.	
Fig. 16. An example with a peculiar aspect due to exfoliation of the shell.	
Nat. Mus. Cat. Invert. Foss., 22907.	



NERITIDÆ AND TURRITELLIDÆ.

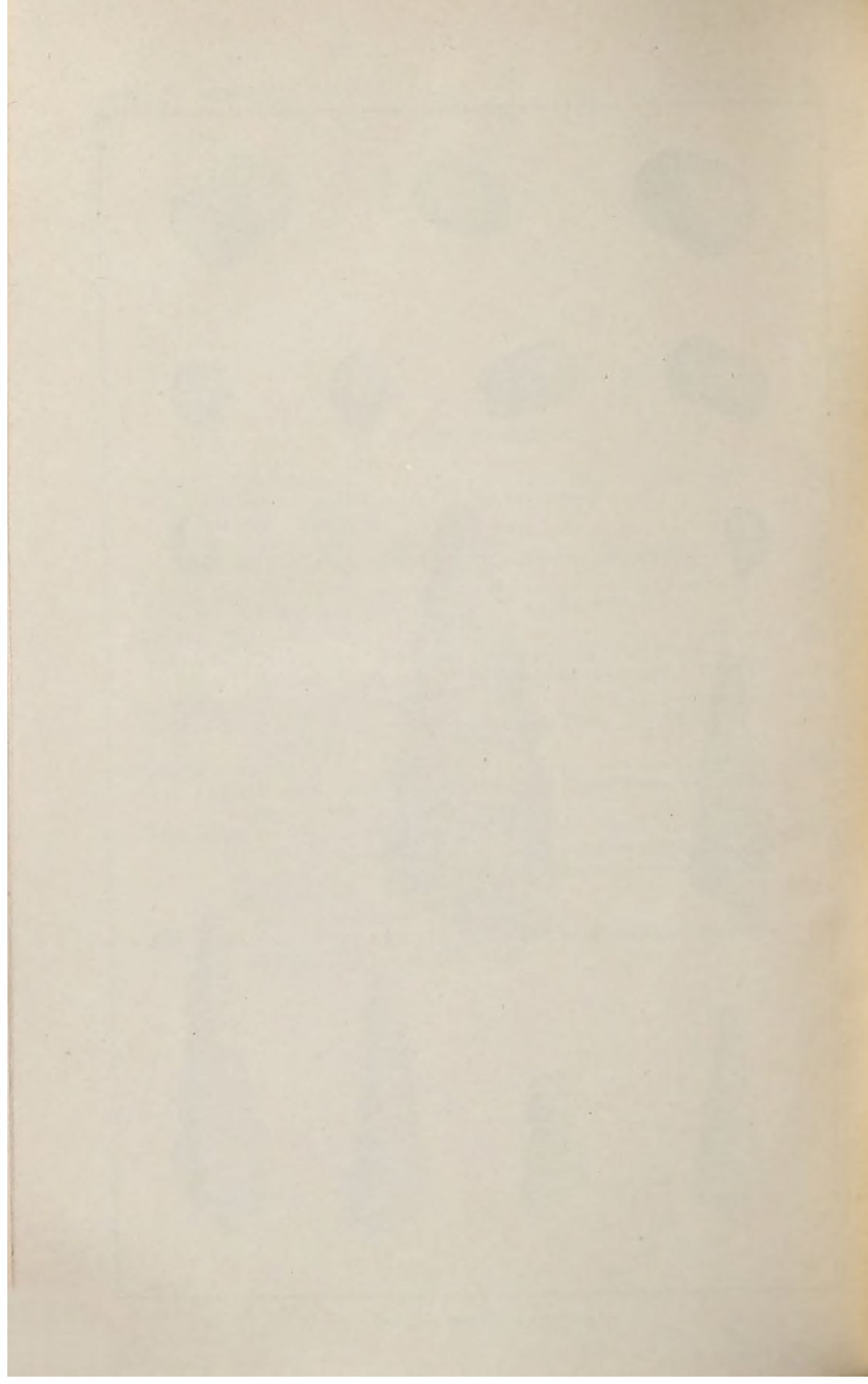
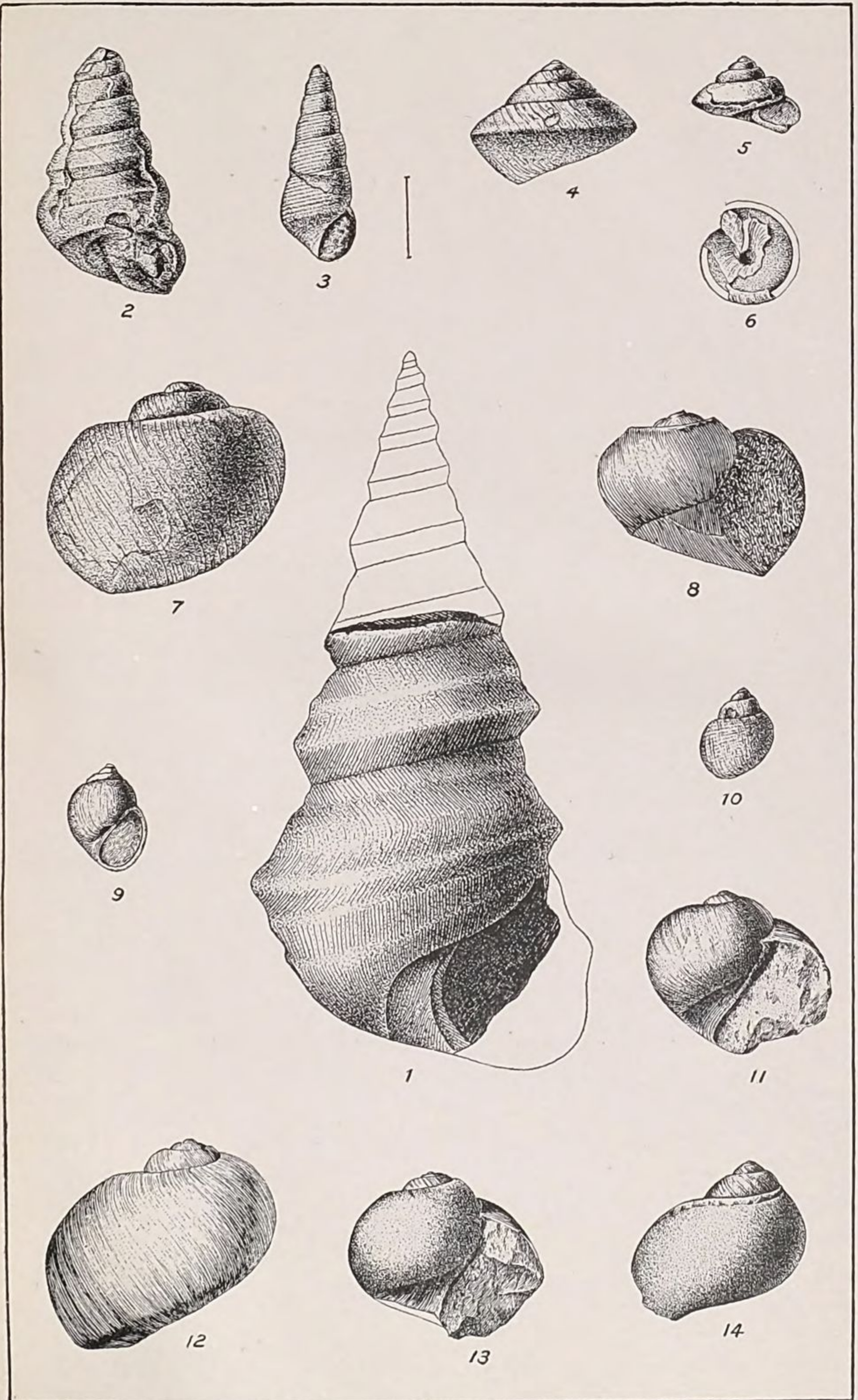


PLATE XXIX.

PLATE XXIX.

	Page.
GLAUCONIA COALVILLENSIS Meek.....	132
Fig. 1. An usually large specimen, showing the umbilicus; the type of <i>Cassiope whitfieldi</i> (after White).	
2. An umbilicated specimen from Coalville, Utah, somewhat distorted by pressure. (See Pl. XXVIII.)	
Nat. Mus. Cat. Invert. Foss., 18446.	
TURRITELLA MICRONEMA Meek.....	131
Fig. 3. Aperture view enlarged. The outer lip and base of aperture are broken.	
Nat. Mus. Cat. Invert. Foss., 22908.	
XENOPHORA SIMPSONI n. sp	133
Nat. Mus. Cat. Invert. Foss., 22909.	
Fig. 4. Dorsal view of small specimen enlarged two diameters.	
5. Aperture view of a cast retaining portions of the shell. Natural size.	
6. View of base of the same specimen, showing the umbilicus.	
GYRODES CONRADI Meek.....	136
Fig. 7. Dorsal view of an example from Huerfano park, Colorado.	
Nat. Mus. Cat. Invert. Foss., 22910.	
8. Aperture view of the type (after Meek).	
LUNATIA CONCINNA H. & M. ?.....	134
Nat. Mus. Cat. Invert. Foss., 22911.	
Fig. 9. Aperture view.	
10. Dorsal view of another specimen, showing the revolving sculpture.	
GYRODES DEPRESSA Meek.....	135
Nat. Mus. Cat. Invert. Foss., 22912.	
Fig. 11. Aperture view of a medium-sized specimen.	
12. Dorsal view of a large example.	
13. Aperture view of another specimen differing slightly in form.	
14. Dorsal view of a specimen in which the spire is unusually prominent and elevated.	

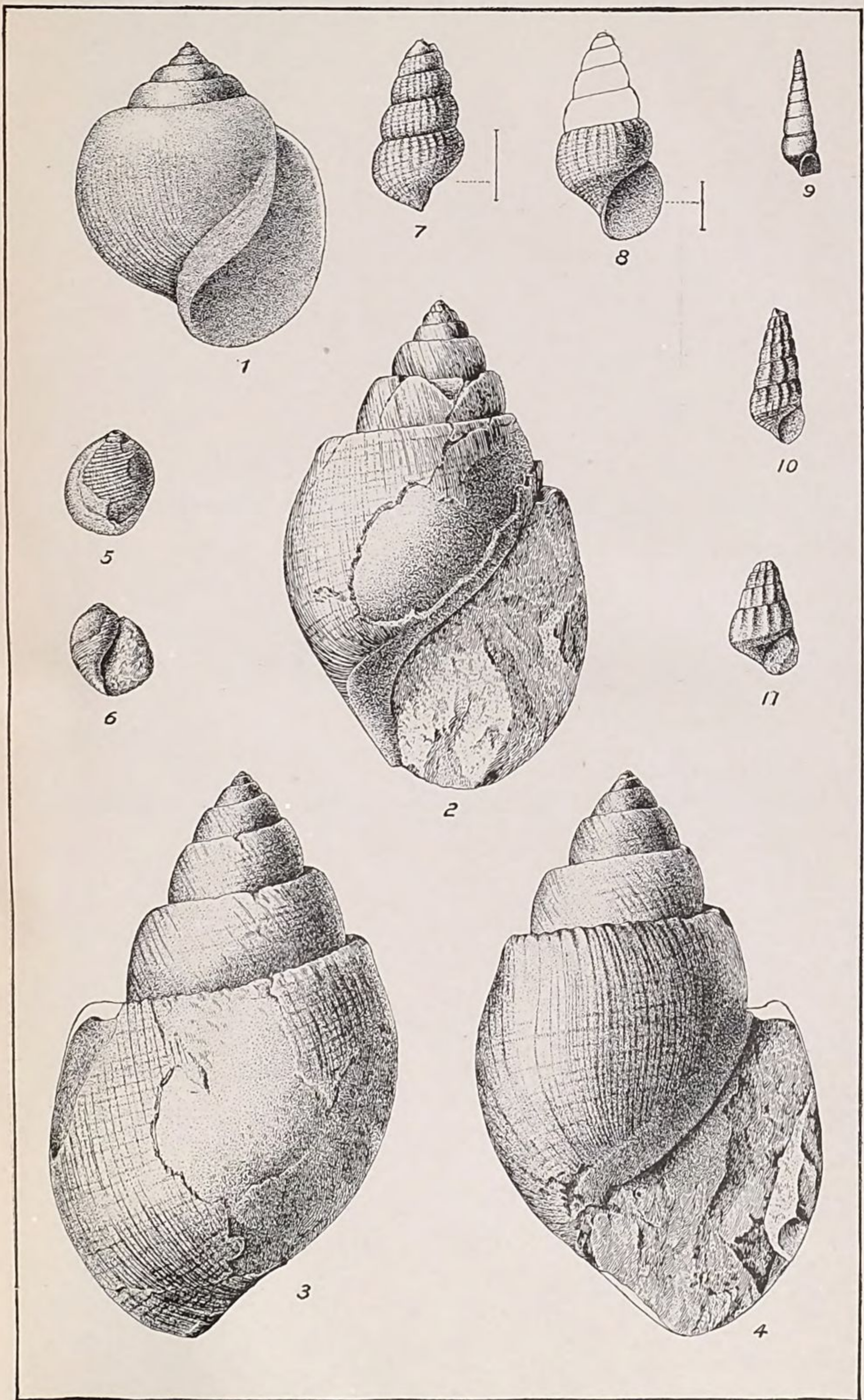


TURRITELLIDÆ, XENOPHORIDÆ AND NATICIDÆ.

PLATE XXX.

PLATE XXX.

	Page.
Fig. 1. Aperture view restored from the type specimen (after White).	
AMAUROPSIS UTAHENSIS White.....	138
AMAUROPSIS BULBIFORMIS Sowerby	137
Nat. Mus. Cat. Invert. Foss., 22913.	
Fig. 2. Aperture view. A small portion of the shell is broken away at the base of the aperture. The spiral punctate lines are not quite so prominent on the specimen.	
3, 4. Opposite views of a larger specimen.	
SIGARETUS (EUNATICINA?) TEXTILIS, n. sp.....	139
Nat. Mus. Cat. Invert. Foss., 22914.	
Fig. 5. Dorsal view of a specimen of average size showing the surface ornamentation. (The outer lip is not thickened, as the drawing would indicate. The appearance is caused by accidental defects and by the absence of revolving sculpture on that part of the shell.)	
6. Aperture view of smaller specimen. The inner lip and umbilicus are concealed in the dark shadow.	
MESOSTOMA OCCIDENTALIS n. sp	139
Nat. Mus. Cat. Invert. Foss., 22915.	
7. Dorsal view of a nearly perfect specimen, enlarged.	
8. Aperture view of a fragment.	
EULIMELLA? FUNICULA Meek	140
Fig. 9. Aperture view of Meek's type (after White).	
CHEMNITZIA? COALVILLENSIS Meek.....	141
Nat. Mus. Cat. Invert. Foss., 22916.	
10. Aperture view of a slender specimen.	
11. Aperture view of a stouter specimen. The outer lip and base of the aperture are broken in both examples.	



NATICIDÆ, PYRAMIDELLIDÆ AND RISSOIDÆ.

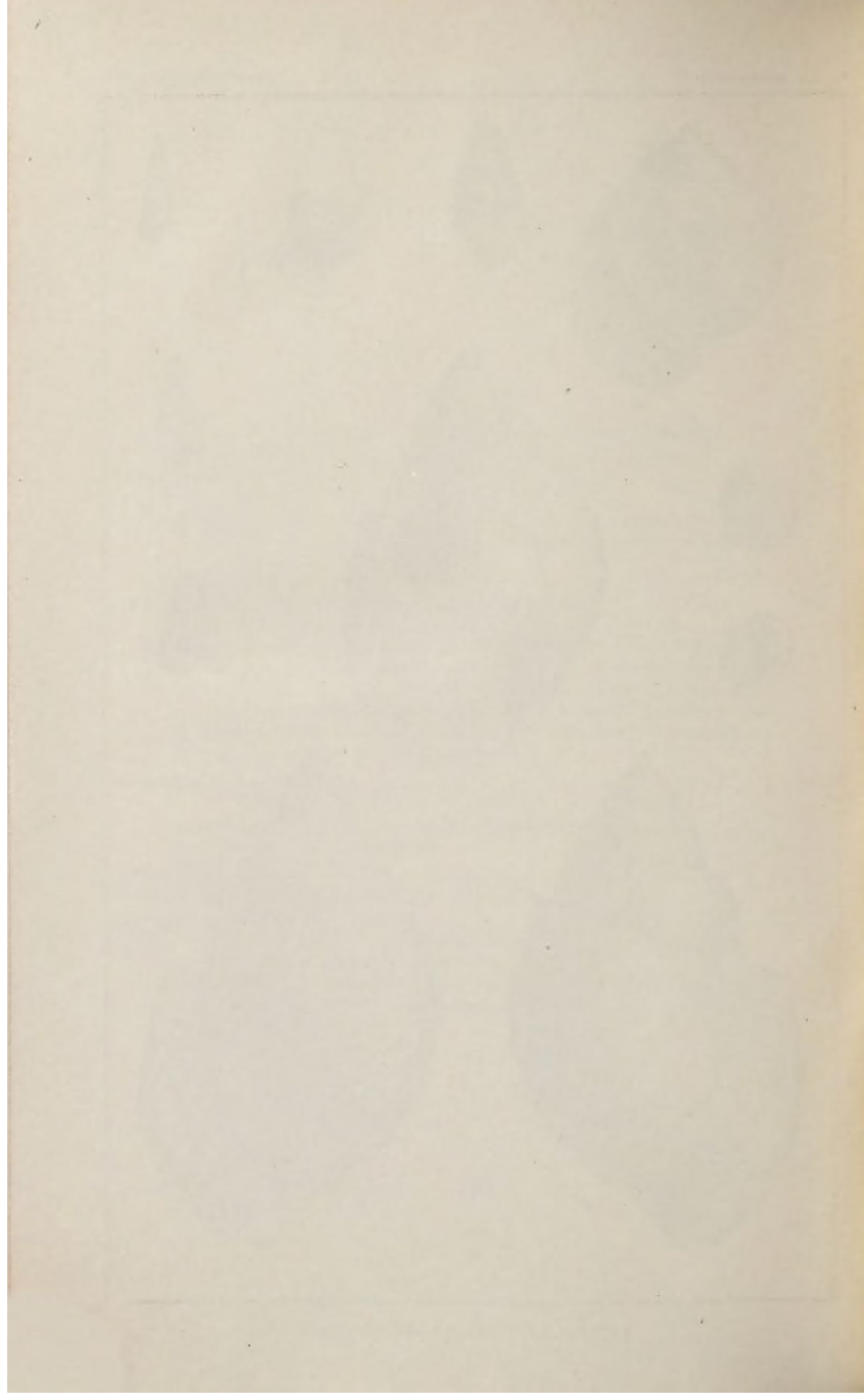
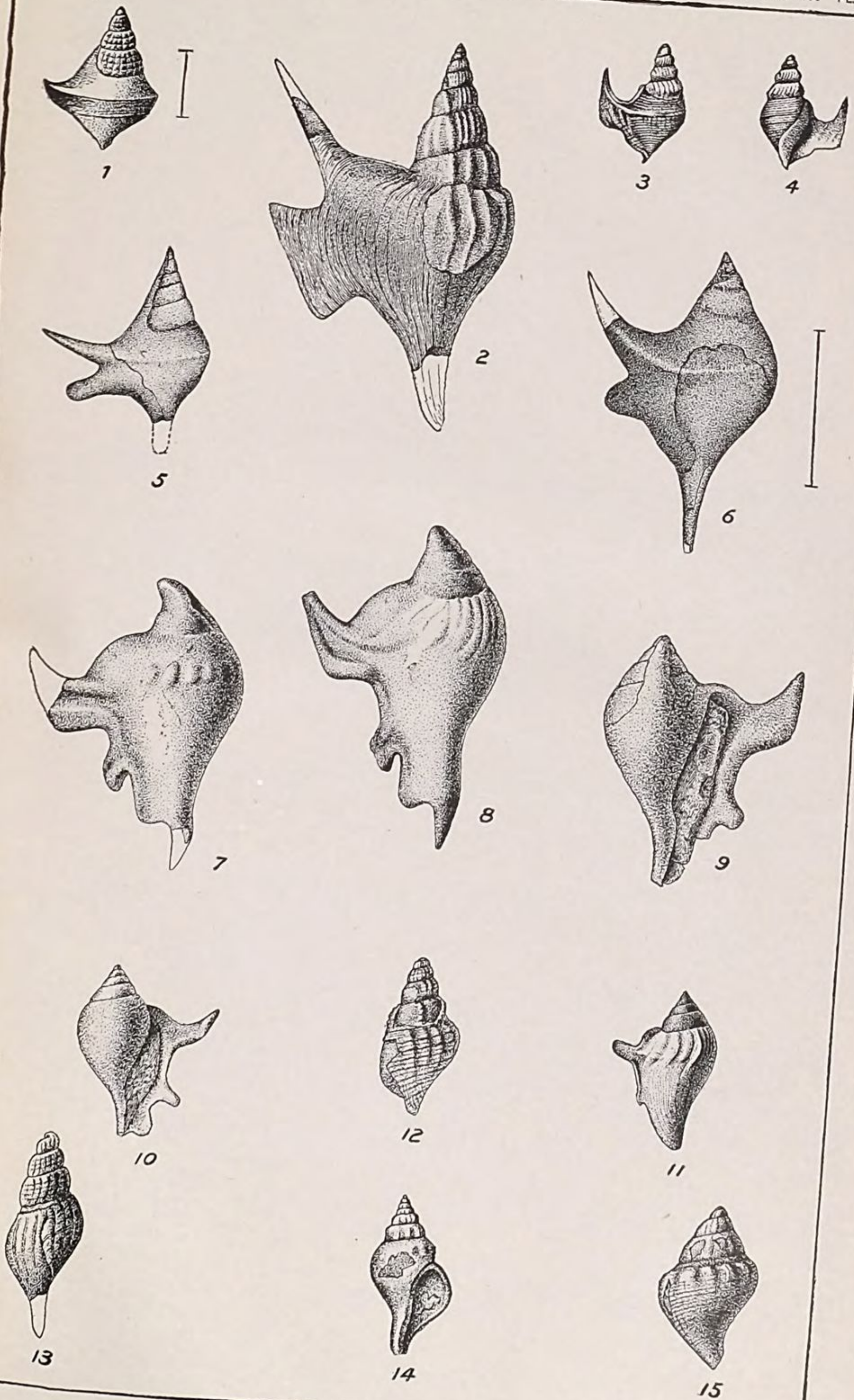


PLATE XXXI.

PLATE XXXI.

	Page.
APORRHAI (GONIOCHEILA) CASTORENSIS Whitfield.....	143
Fig. 1. Dorsal view of the type (after Whitfield).	
APORRHAI (PERISSOPTERA?) PROLABIATA White.....	144
Fig. 2. Dorsal view of a large specimen with portions of the beak and wing restored from two specimens. The restoration of the beak is perhaps somewhat too long.	
Nat. Mus. Cat. Invert. Foss., 22917.	
ANCHURA (DREPANOCHILUS) RUIDA White.....	145
Fig. 3, 4. Opposite views of the type (after White).	
LISPODESTHES NUPTIALIS White	147
Fig. 5. Dorsal view of small specimen, the type of <i>Lisposdesthes lingulifera</i> , enlarged (after White).	
6. Dorsal view of the type of the species, enlarged (after White).	
PUGNELLUS FUSIFORMIS Meek	148
Nat. Mus. Cat. Invert. Foss., 22918.	
Fig. 7. Dorsal view of an adult specimen, showing the very heavy callus-covering the spire and with the costæ of the body volution shortened into round nodes.	
8. Dorsal view of a large specimen of the usual form. The tip of the wing-like projection of the outer lip is broken off.	
9. Aperture view of a medium sized specimen. The thinner portions of the callus covering the spire have been exfoliated.	
10. Aperture view of an immature specimen on which the callus has not yet developed.	
11. Dorsal view of a still younger individual showing the character of the outer lip at this stage of growth.	
TRITONIUM KANABENSE n. sp.....	150
Fig. 12. Dorsal view of the imperfect type specimen.	
Nat. Mus. Cat. Invert. Foss., 22919.	
FUSUS SHUMARDI H. & M. ?	150
Fig. 13. Dorsal view (after Whitfield).	
FUSUS GABBI Meek.....	151
Fig. 14. Aperture view of Meek's type (after White).	
TRITONIDEA ? HUERFANENSIS n. sp.....	152
15. Dorsal view of the type.	
Nat. Mus. Cat. Invert. Foss., 22920.	



APORRHAIIDÆ, STROMBIDÆ, TRITONIDÆ AND FUSIDÆ.

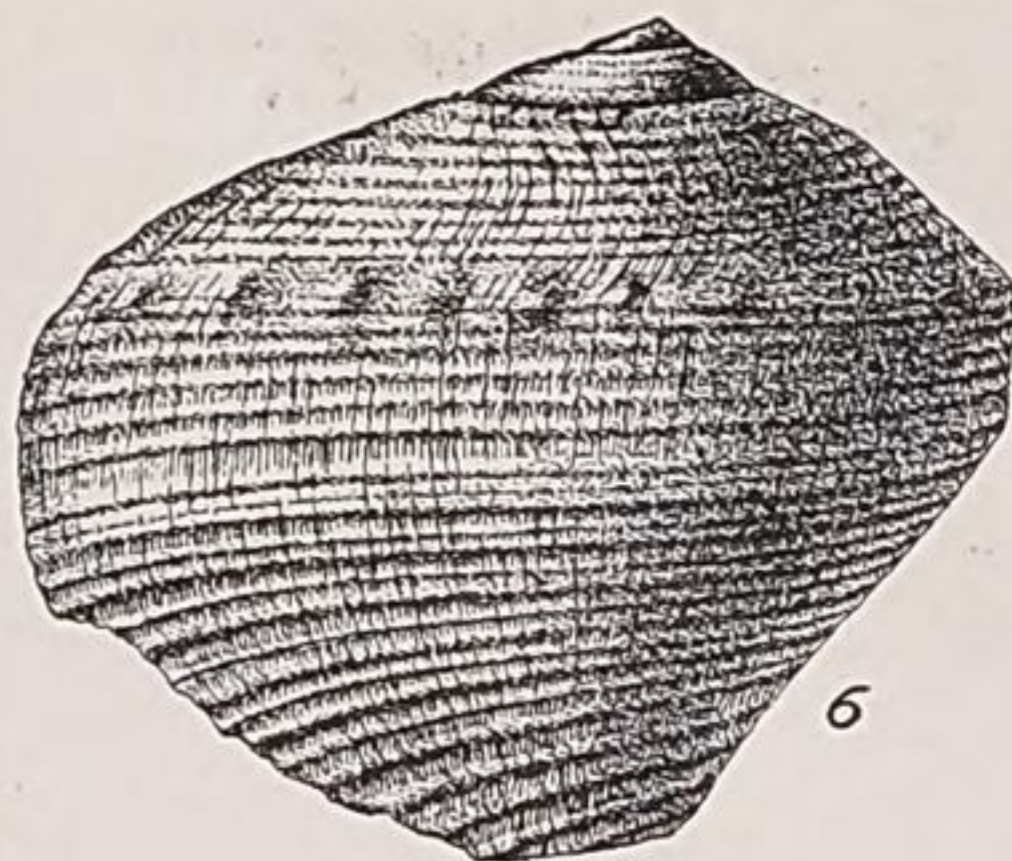
PLATE XXXII.

PLATE XXXII.

	Page.
FUSUS (NEPTUNEA?) VENENATUS n. sp.	152
Nat. Mus. Cat. Invert. Foss., 22921.	
Fig. 1. Dorsal view of a small specimen differing slightly from the type; a part of the surface restored.	
2. Aperture view of the type specimen in which the beak is lacking.	
FASCIOLARIA? (CRYPTORHYTIS) UTAHENSIS Meek	153
Nat. Mus. Cat. Invert. Foss., 22922.	
Fig. 3. Aperture view showing the single fold on the columella. The fold is much stronger farther back in the shell.	
4. Dorsal view of another specimen with a small part of the surface restored.	
FASCIOLARIA? WALCOTTI n. sp.	153
5. Dorsal view of the type.	
Nat. Mus. Cat. Invert. Foss., 22923.	
PYROPSIS COLORADOENSIS n. sp.	154
Nat. Mus. Cat. Invert. Foss., 22924.	
Fig. 6. Dorsal view of fragment showing spire and upper part of body whorl; part of surface restored.	
7. Aperture view of another specimen slightly restored in the lower part of the beak.	
8. Dorsal view of the cast showing the full form.	



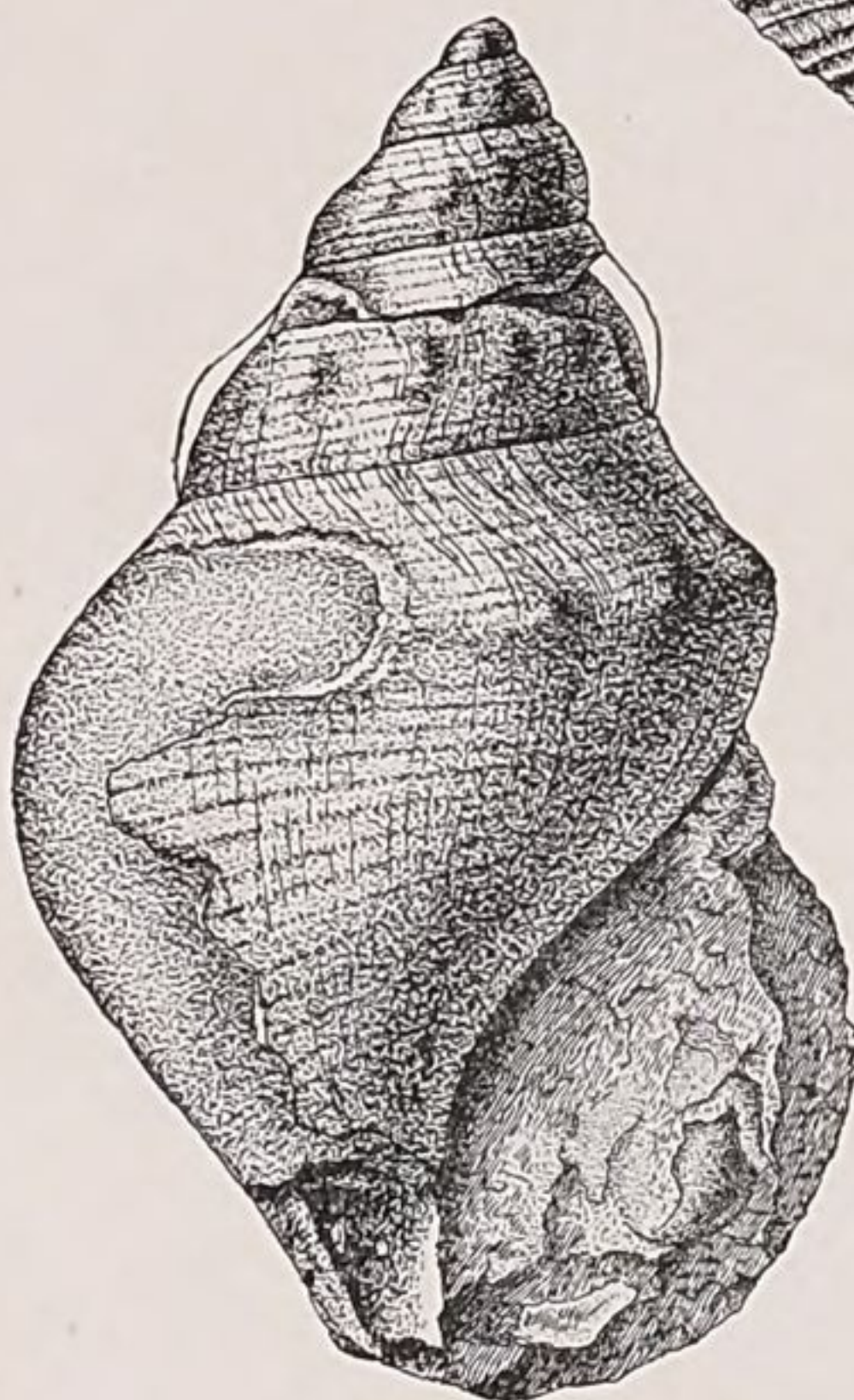
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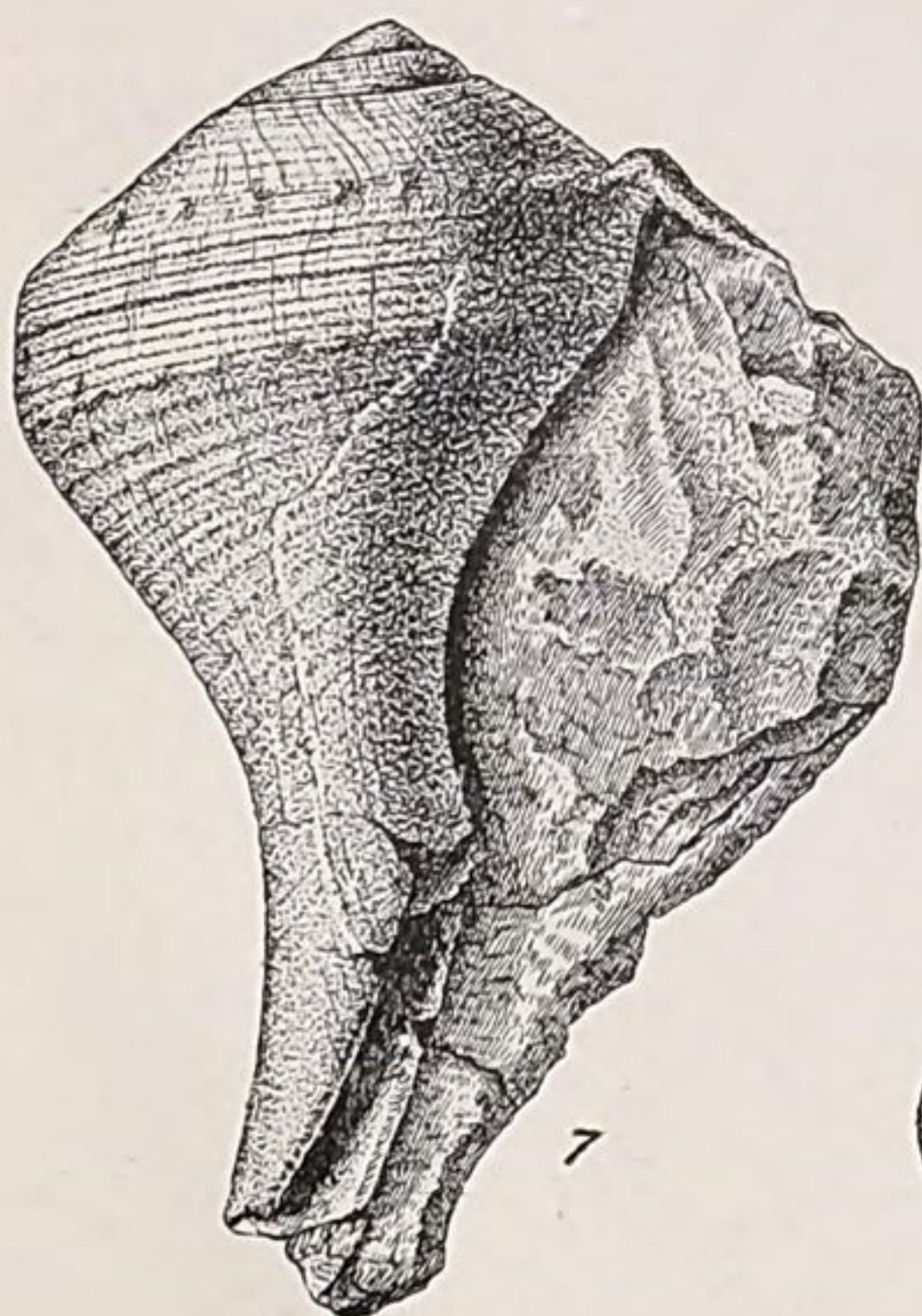
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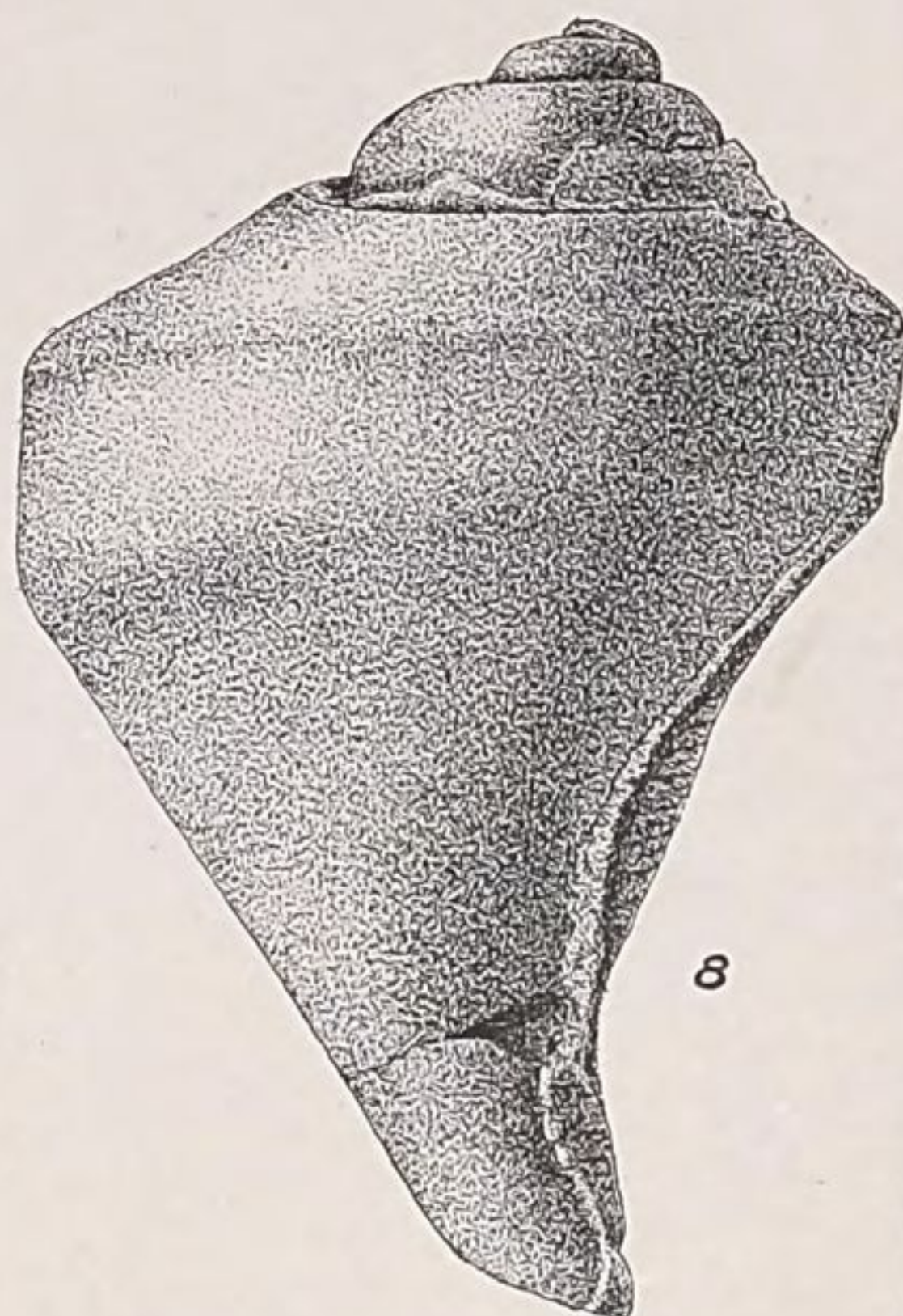
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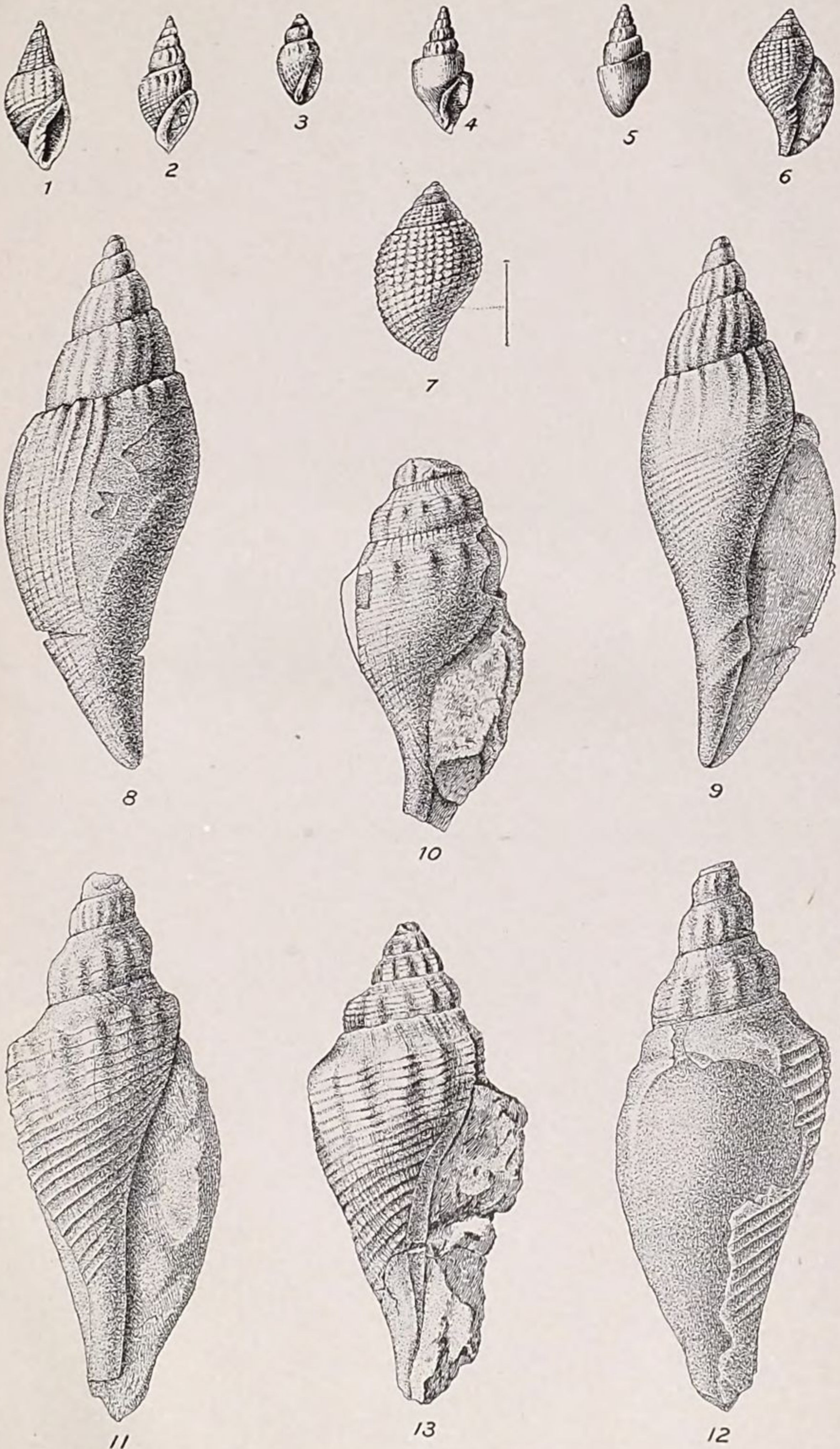
PLATE XXXIII.

Bull. 106—17

257

PLATE XXXIII.

	Page.
ADMETOPSIS SUBFUSIFORMIS Meek	159
Fig. 1. Aperture view of a specimen from southern Utah referred to <i>Admetopsis gregaria</i> (after Meek.)	
2. Similar view of an example from Coalville, Utah (after Meek).	
ADMETOPSIS RHOMBOIDES Meek	158
Fig. 3. Aperture view of one of the types (after Meek).	
ADMETOPSIS HUMEROSA n. sp	160
Fig. 4. Aperture view.	
Nat. Mus. Cat. Invert. Foss., 22925.	
5. Dorsal view of another example.	
CANCELLARIA MALACHITENSIS n. sp	158
Nat. Mus. Cat. Invert. Foss., 22926.	
Fig. 6. Aperture view of a large specimen.	
7. Dorsal view of a smaller specimen, enlarged.	
ROSTELLITES AMBIGUA n. sp	156
Fig. 8. Dorsal view of a specimen of average size.	
9. Aperture view of same showing folds on the columella.	
Nat. Mus. Cat. Invert. Foss., 22927.	
10. Aperture view of another specimen that is doubtfully referred to this species.	
Nat. Mus. Cat. Invert. Foss., 22929.	
ROSTELLITES DALLI n. sp	156
Fig. 11, 12. Two views of the best preserved type. The columellar folds are not so strong as in <i>R. ambigua</i> and are not visible from the front in unbroken specimens.	
Nat. Mus. Cat. Invert. Foss., 22928.	
13. Aperture view of a stouter individual.	



CANCELLARIDÆ AND VOLUTIDÆ.

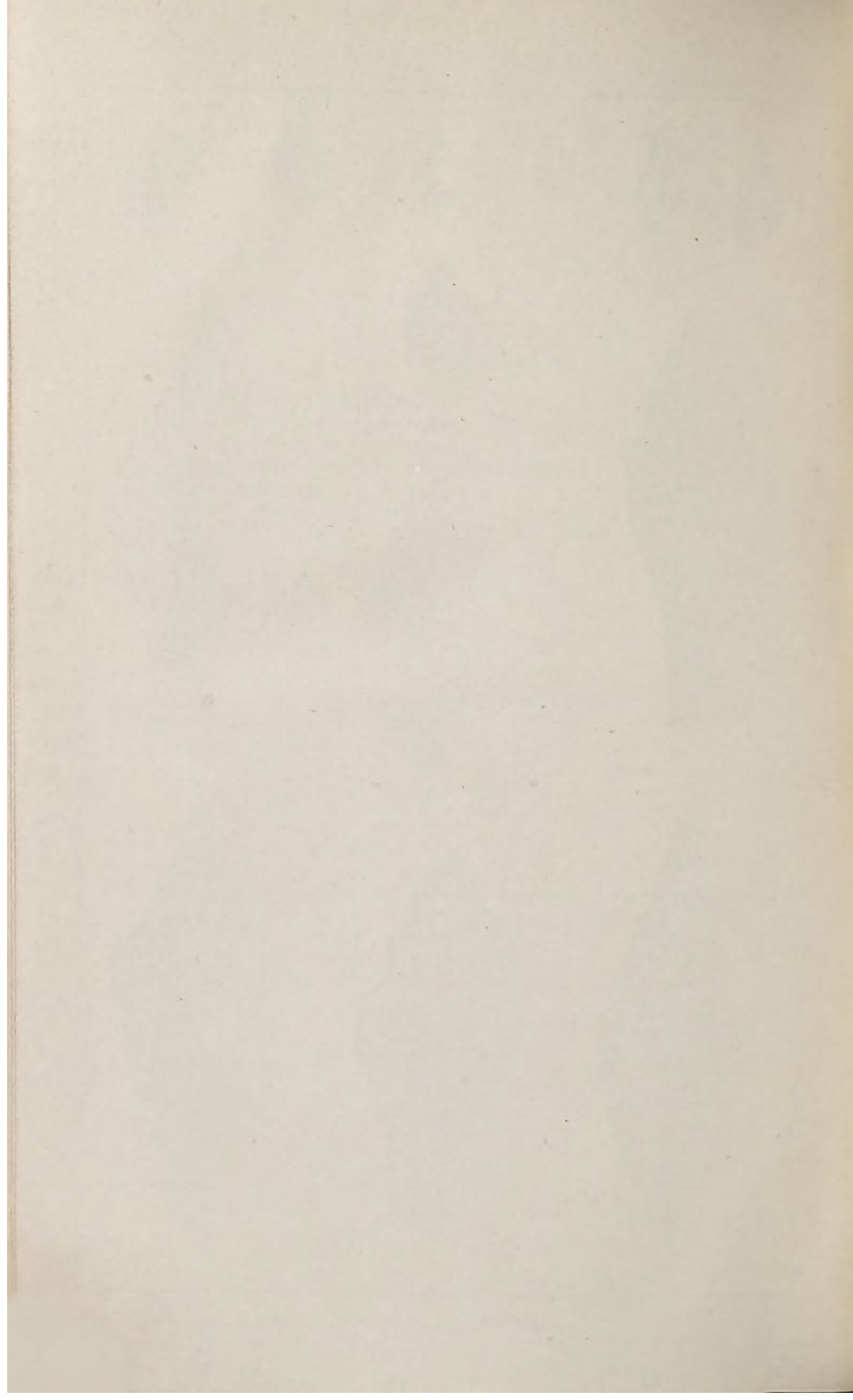
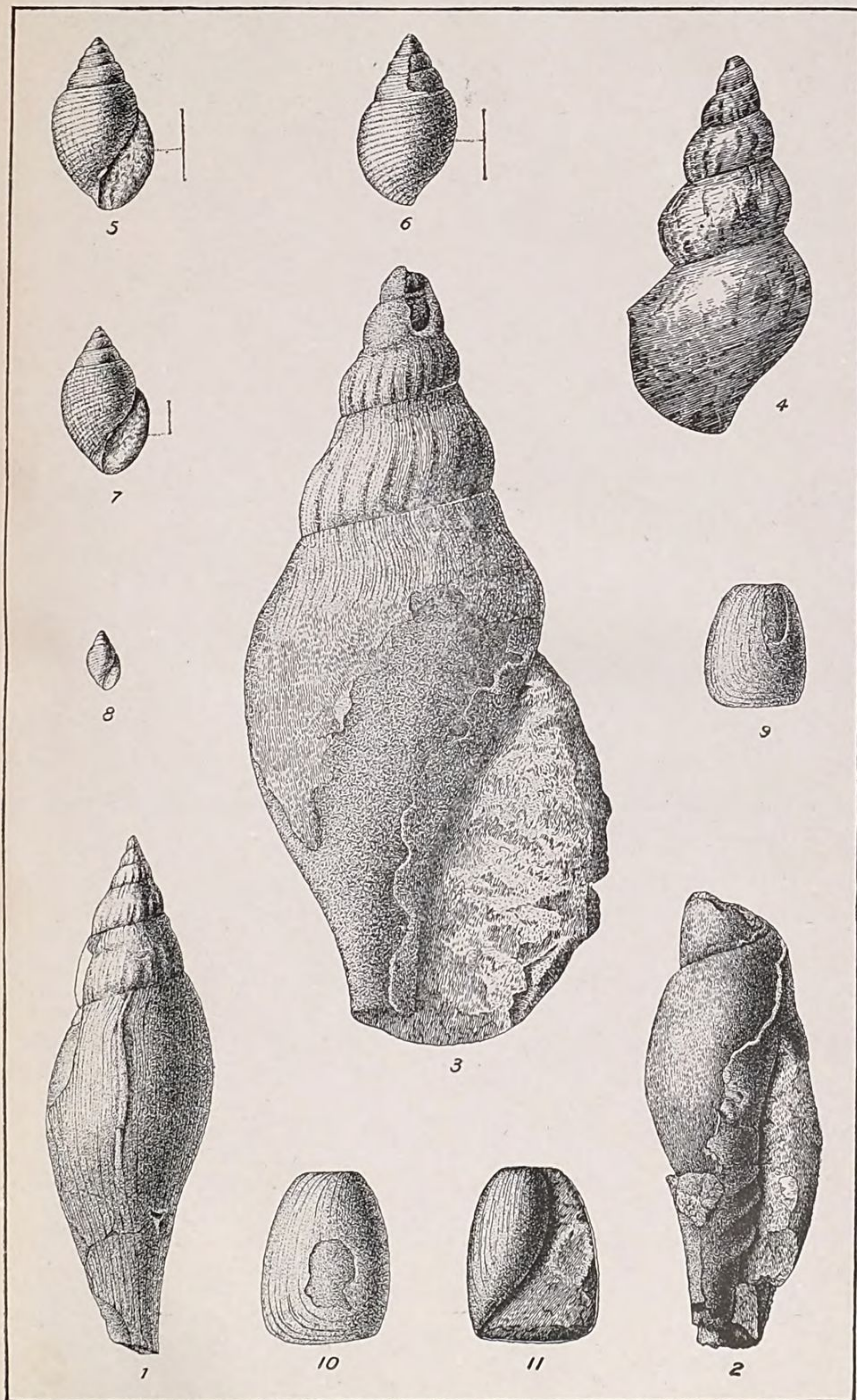


PLATE XXXIV.

PLATE XXXIV.

	Page.
ROSTELLITES GRACILIS n. sp.	157
Nat. Mus. Cat. Invert. Foss, 22930.	
Fig. 1. Dorsal view of a small specimen.	
2. Aperture view of a fragment showing the strong folds on the columella.	
3. Aperture view of a very large specimen believed to belong to this species.	
PLEUROTOMA? HITZI Meek	161
Fig. 4. Dorsal view of the type (after Meek).	
ACTÆON PROPINQUUS n. sp.	161
Nat. Mus. Cat. Invert. Foss, 22931.	
Fig. 5, 6. Opposite views of the largest type specimen, enlarged.	
7, 8. Aperture view of another specimen, enlarged and natural size.	
HAMINEA TRUNCATA n. sp.	162
Nat. Mus. Cat. Invert. Foss, 22932.	
Fig. 9. Dorsal view of a small specimen.	
10, 11. Opposite view of a large individual.	



VOLUTIDÆ, PLEUROTOMIDÆ, ACTÆONIDÆ AND BULLIDÆ.

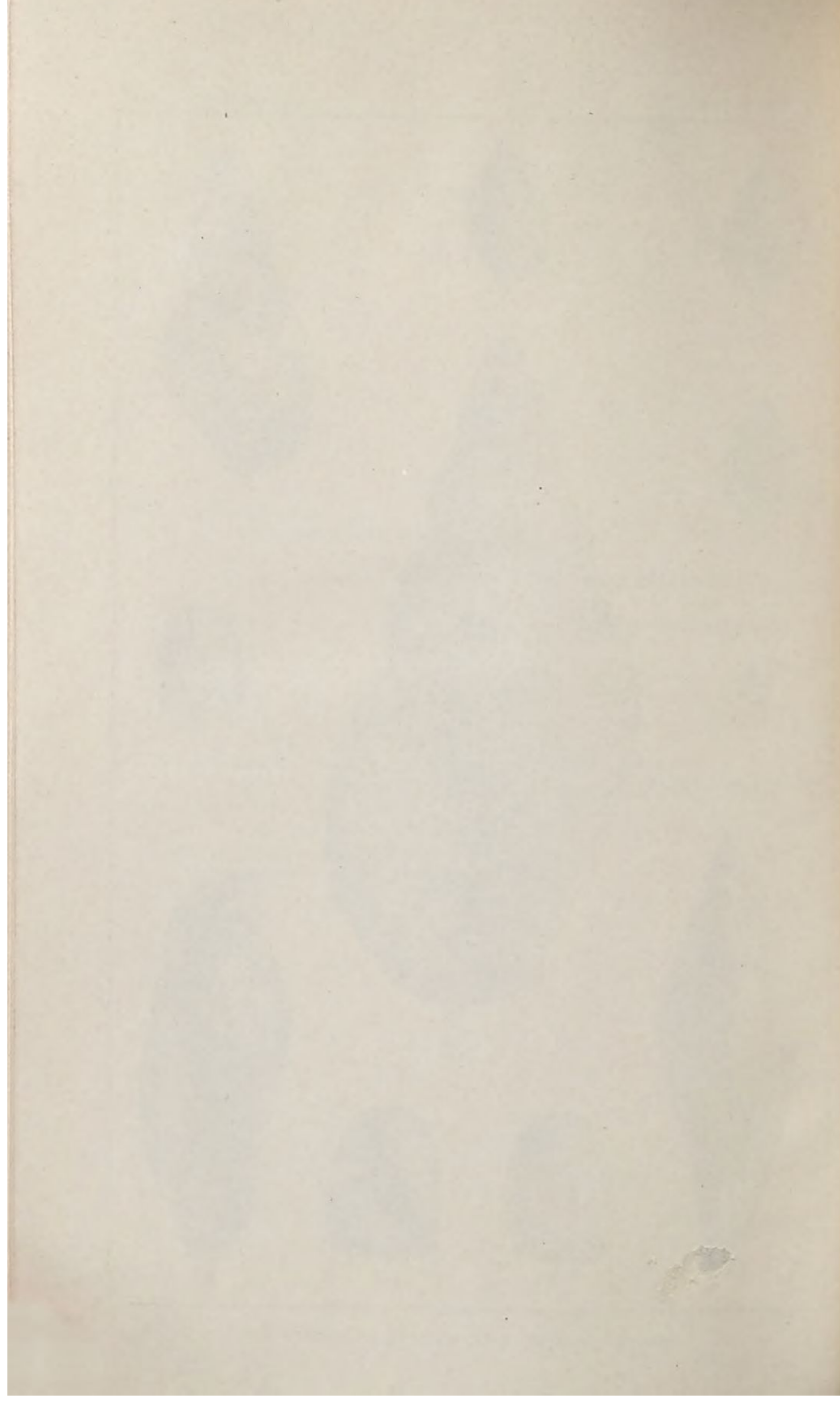
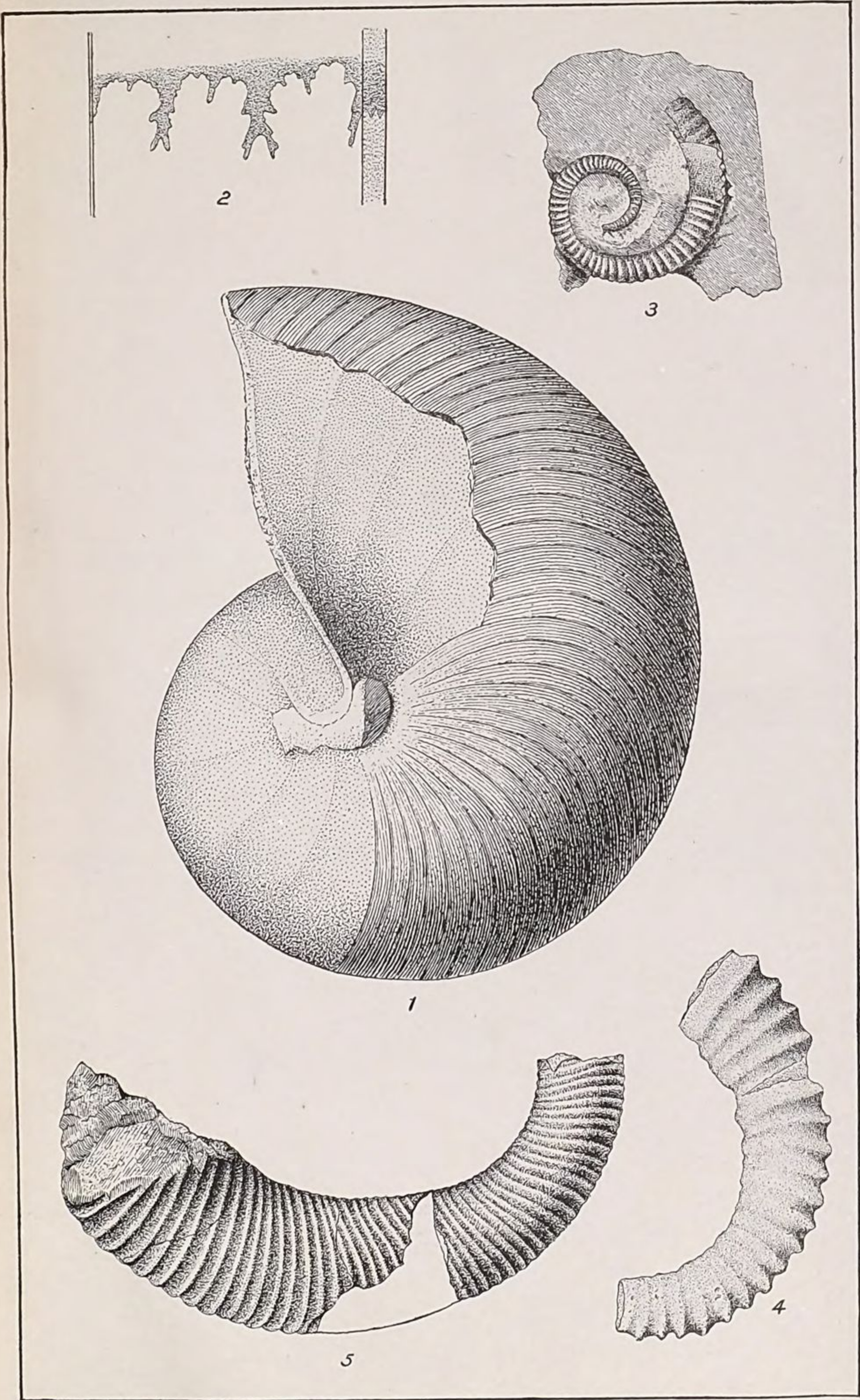


PLATE XXXV.

PLATE XXXV.

	Page.
NAUTILUS ELEGANS Sowerly	163
Fig. 1. Side view of a partly exfoliated specimen (after Meek).	
HELICOCERAS PARIENSE White.....	164
Fig. 2. Septum of the type, magnified.	
Nat. Cat. Mus. Invert. Foss., 8638.	
3. A small coiled specimen showing the form of the earlier volutions.	
Nat. Mus. Cat. Invert. Foss., 22933.	
4. Copy of White's figure of the type.	
HELICOCERAS? CORRUGATUM n. sp	165
Fig. 5. Basal view of the type specimen.	
Nat. Mus. Cat. Invert. Foss., 22934.	



NAUTILOIDEA AND AMMONOIDEA.

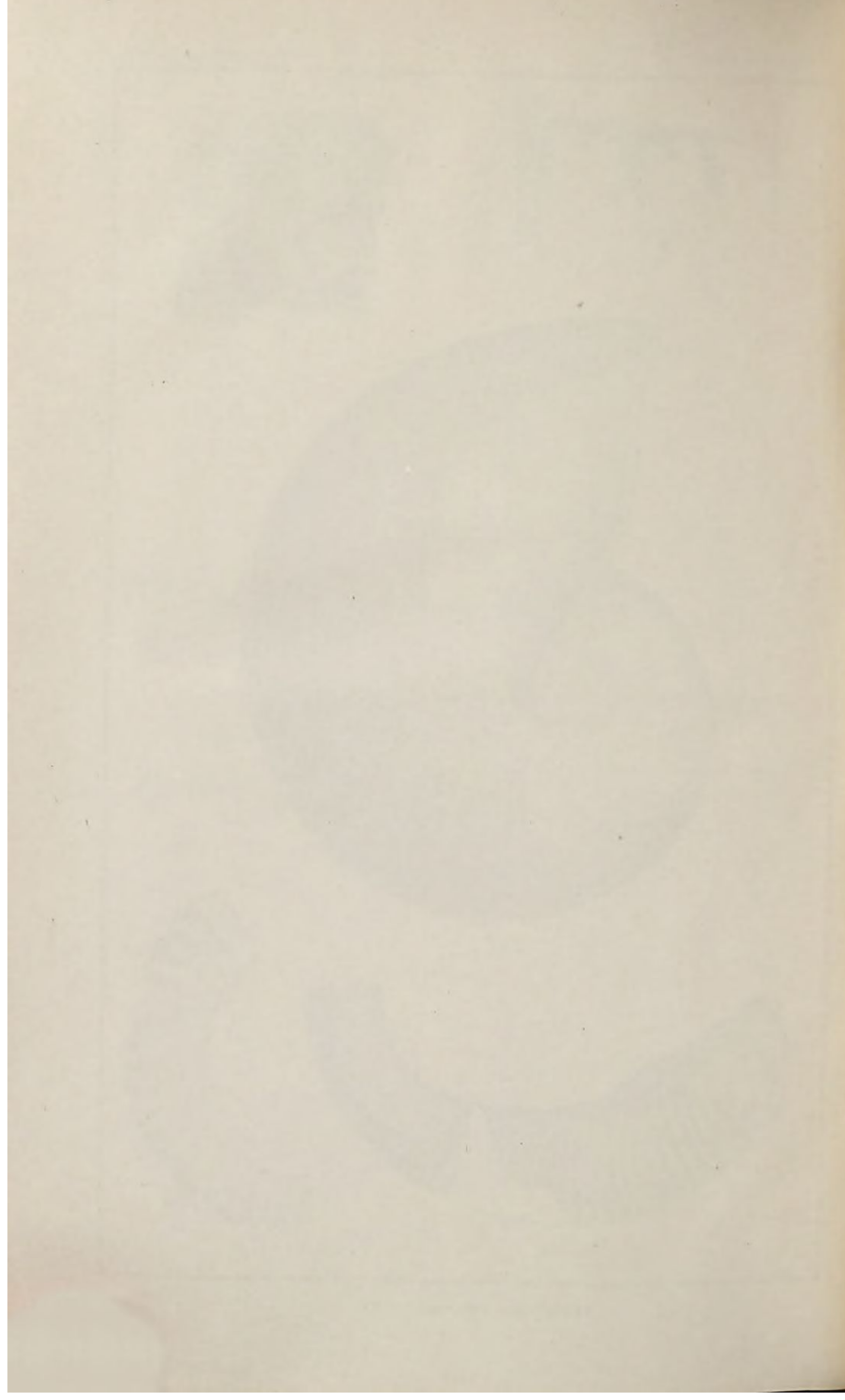
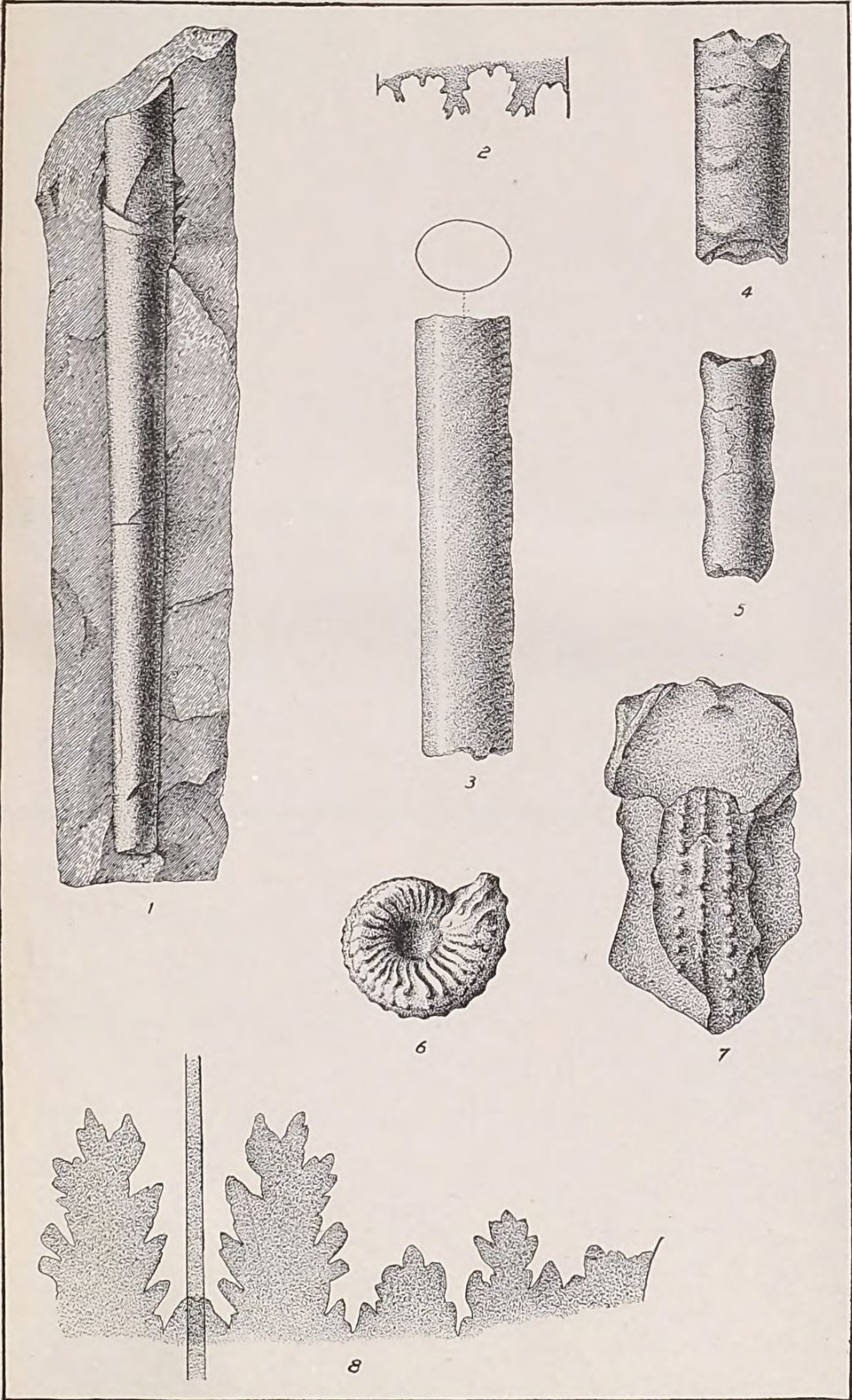


PLATE XXXVI.

PLATE XXXVI.

	Page.
BACULITES GRACILIS Shumard?	166
Nat. Mus. Cat. Invert. Foss., 22935.	
Fig. 1. A long fragment showing the slender form.	
2. Septum of a small specimen, magnified.	
3. Fragment of a large example showing constrictions and undulations of the surface of the cast.	
BACULITES ASPER Morton?	167
Fig. 4, 5. Two views of a fragment showing the character of the nodes.	
Nat. Mus. Cat. Invert. Foss., 22936.	
ACANTHOCERAS? KANABENSE n. sp.	181
Nat. Mus. Cat. Invert. Foss., 22937.	
Fig. 6. Side view of specimen, enlarged two diameters.	
7. Peripheral view of a large imperfect specimen.	
8. Septum of same, enlarged.	

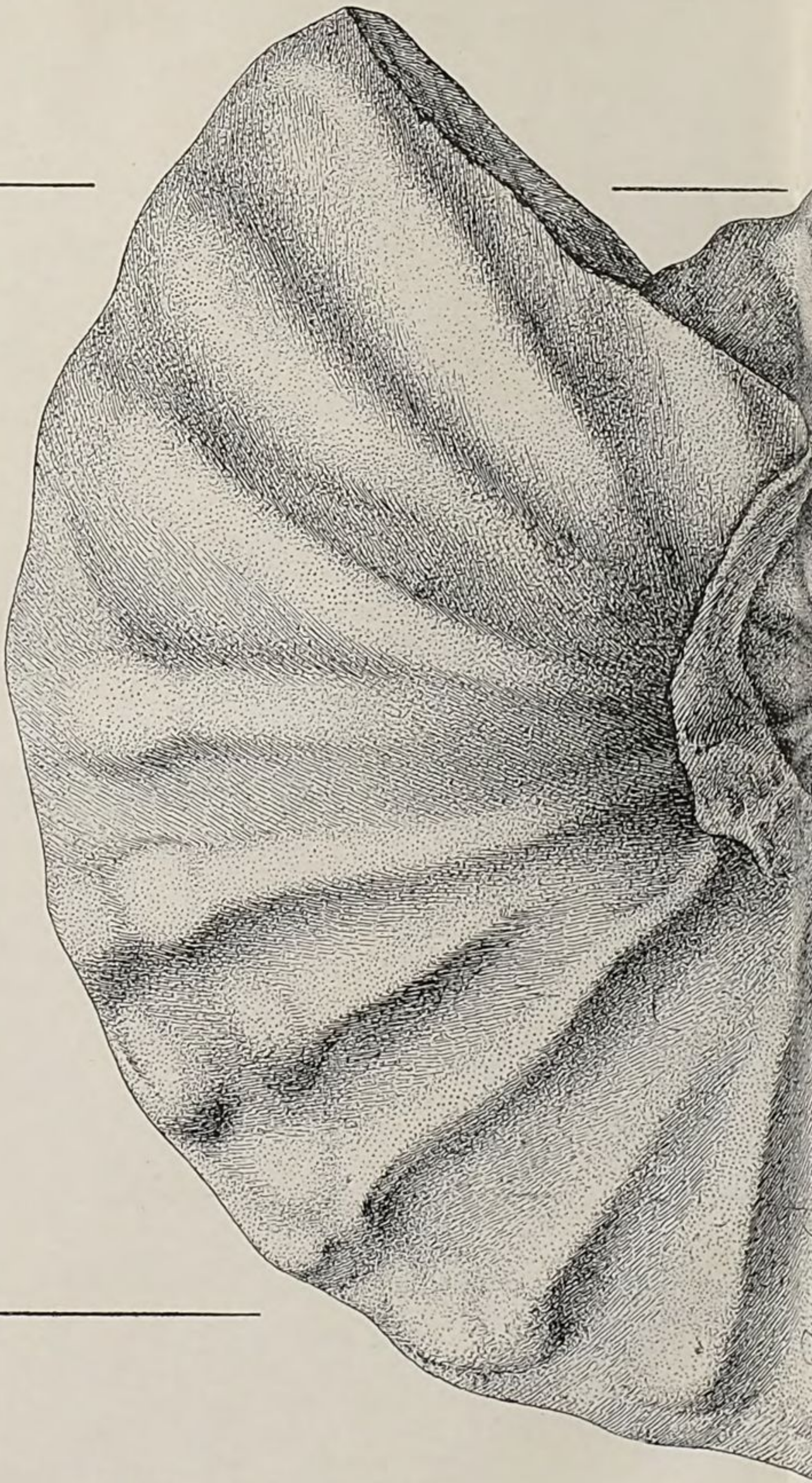


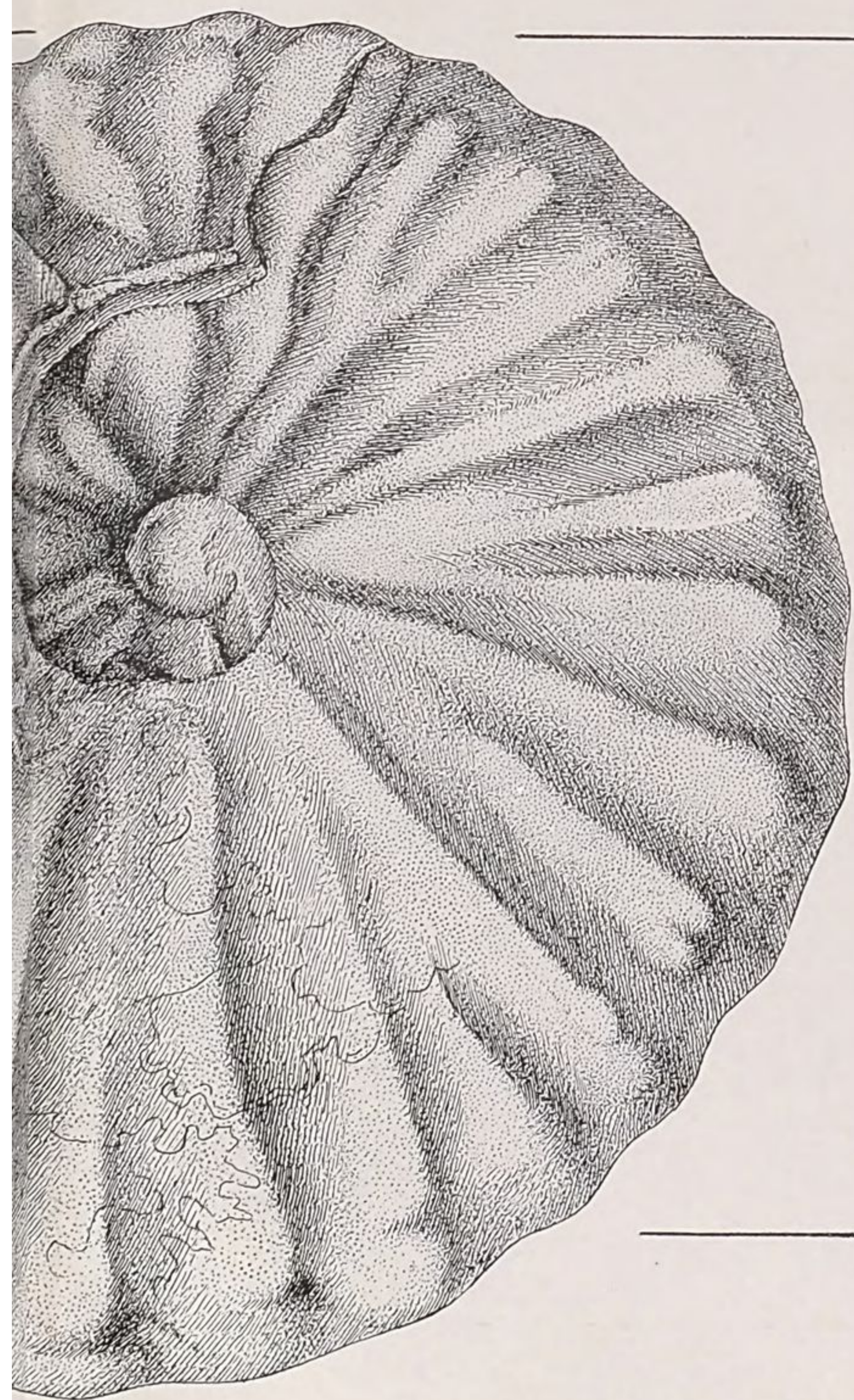
AMMONOIDEA.

PLATE XXXVII.

PLATE XXXVII.

	Page.
BUCHICERAS SWALLOVI Shumard	168
Fig. 1. Side view of large specimen (after White). See Pl. XXXVIII.	





AMMONOIDEA.

PLATE XXXVIII.

PLATE XXXVIII.

	Page.
BUCHICERAS SWALLOVI Shumard.....	168
Nat. Mus. Cat. Invert. Foss., 22938.	
Fig. 1, 2. Two views of a small specimen.	
3. Septum of another example, slightly enlarged. (See Pl. xxxvii.)	

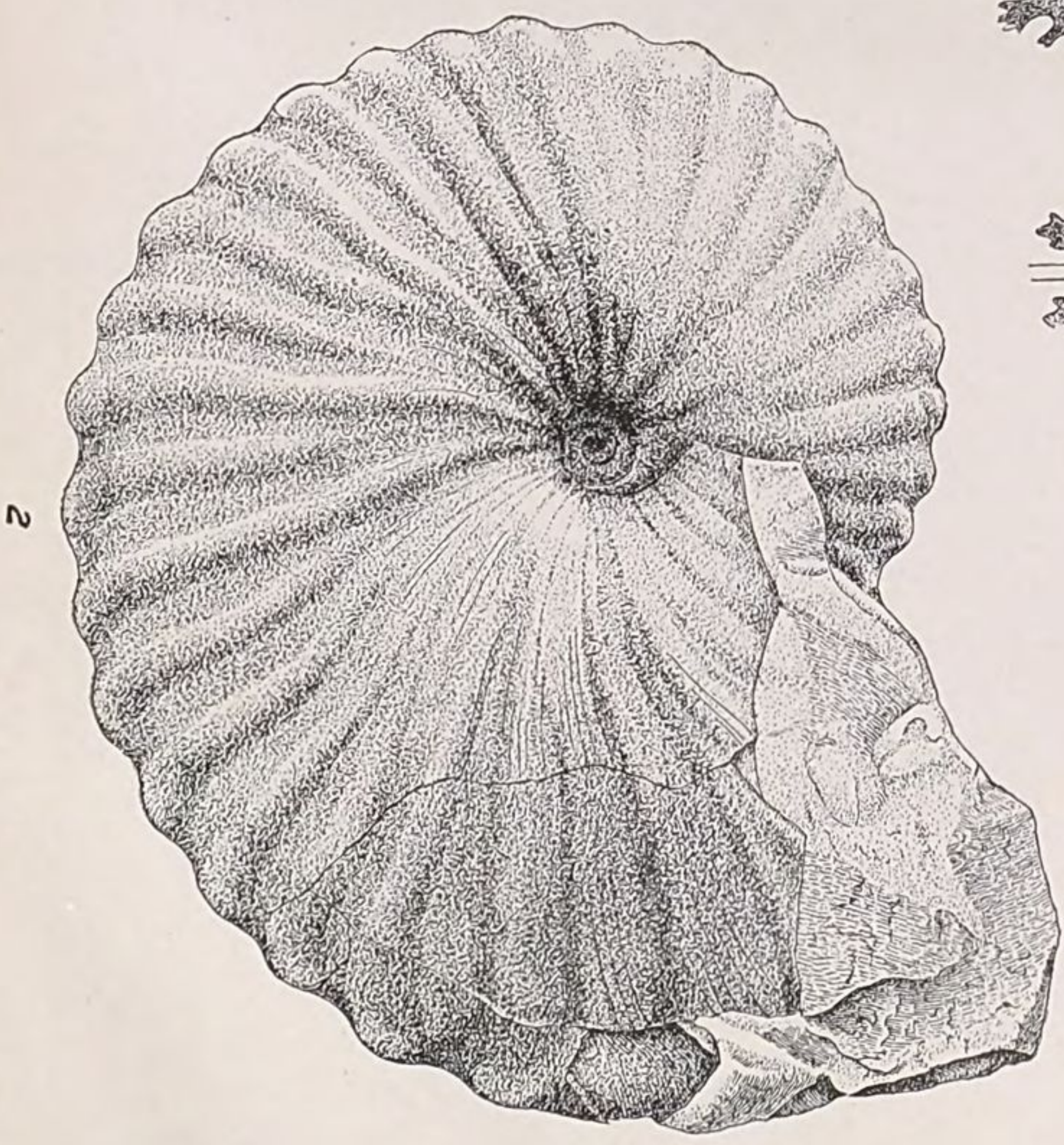
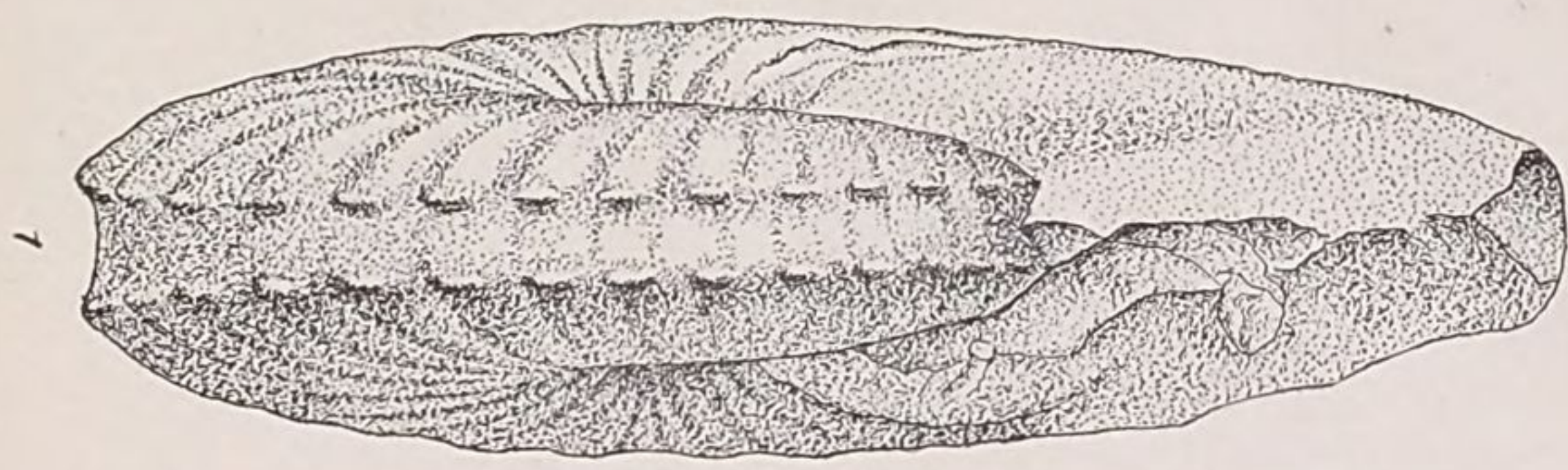


PLATE XXXIX.

PLATE XXXIX.

	Page.
PLACENTICERAS PLACENTA Dekay?.....	169
Nat. Mus. Cat. Invert. Foss., 22939.	

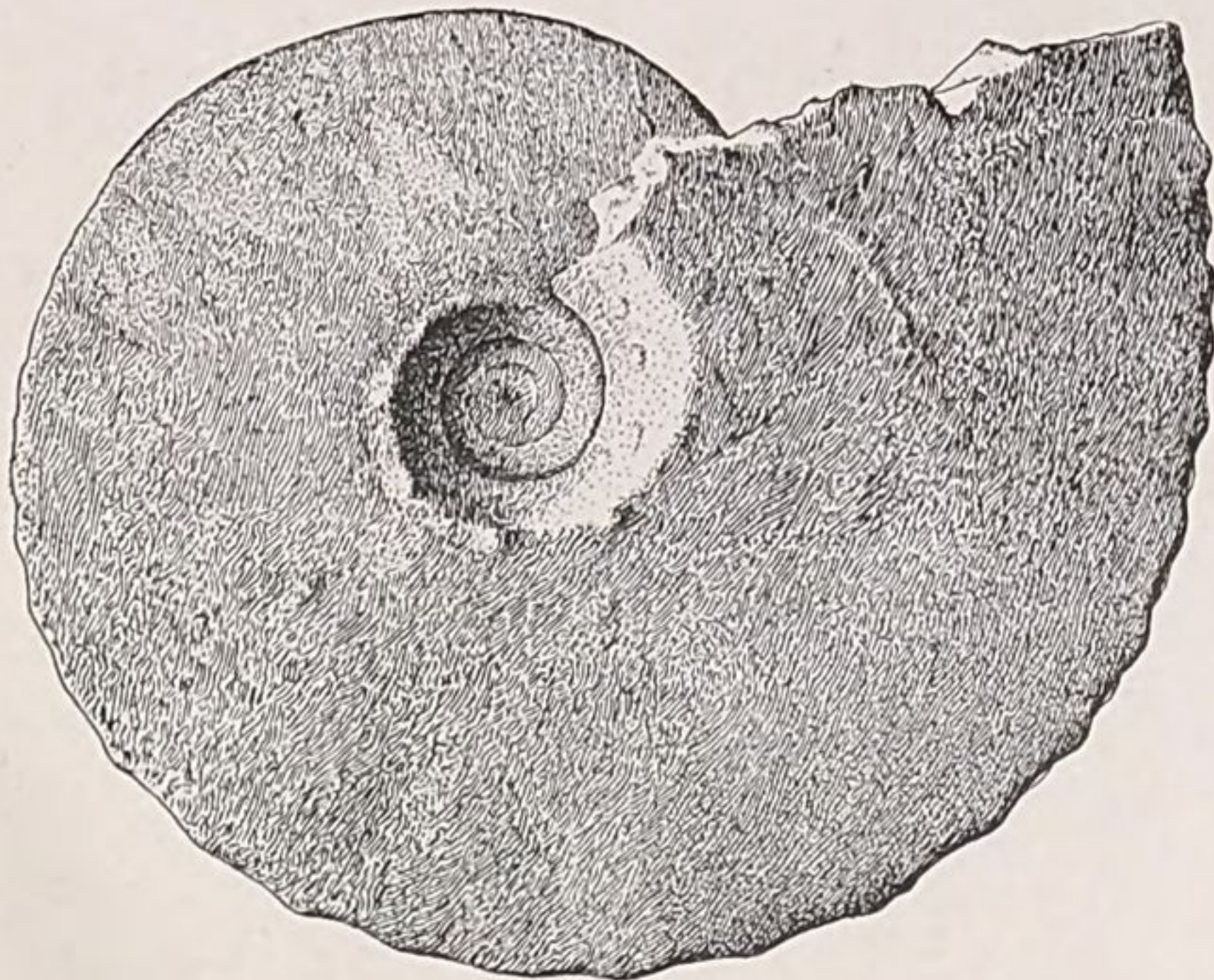
Fig. 1. Septum of an inner volution of a large specimen, magnified.

2, 3. Two views of a small nodose specimen.



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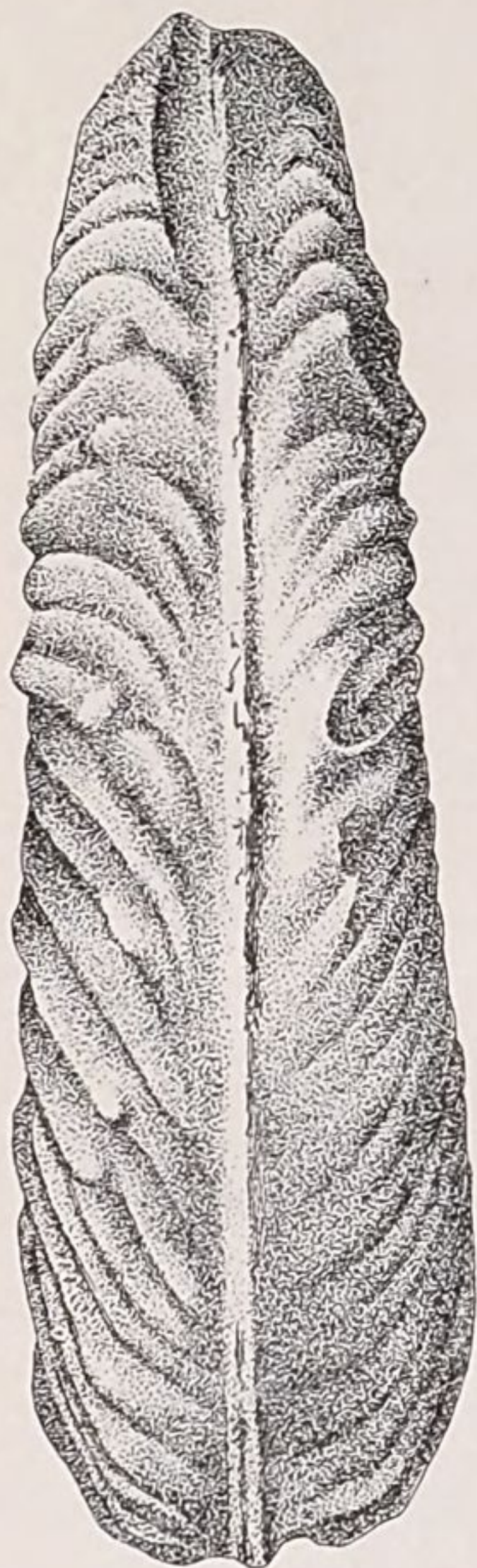


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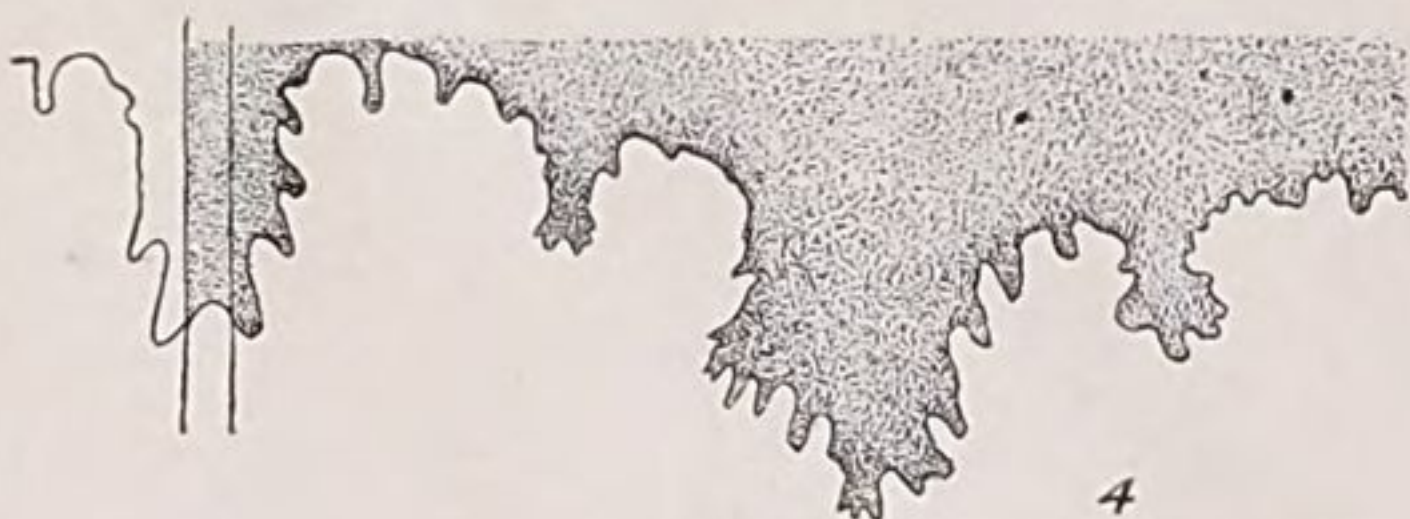
PLATE XL.

PLATE XL.

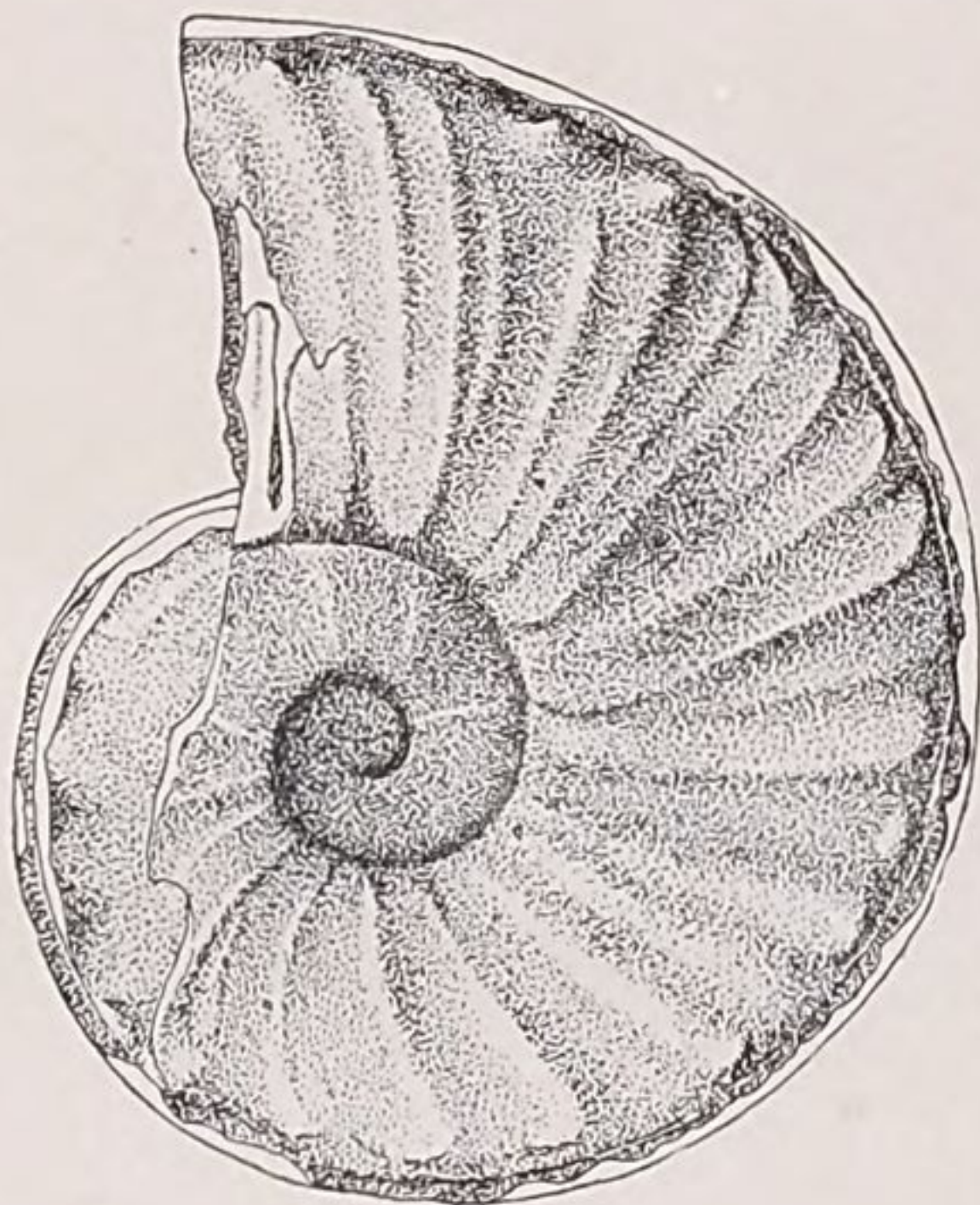
	Page.
PRIONOCYCLUS WYOMINGENSIS Meek.....	171
Fig. 1. Peripheral view of an example from which the keel has been mostly broken away (after White).	
2. Side view of a small example (after White).	
3. Side view of a fragment showing portions of two volutions (after White).	
4. Septum of one of the types.	
Nat. Mus. Cat. Invert. Foss., 7729.	



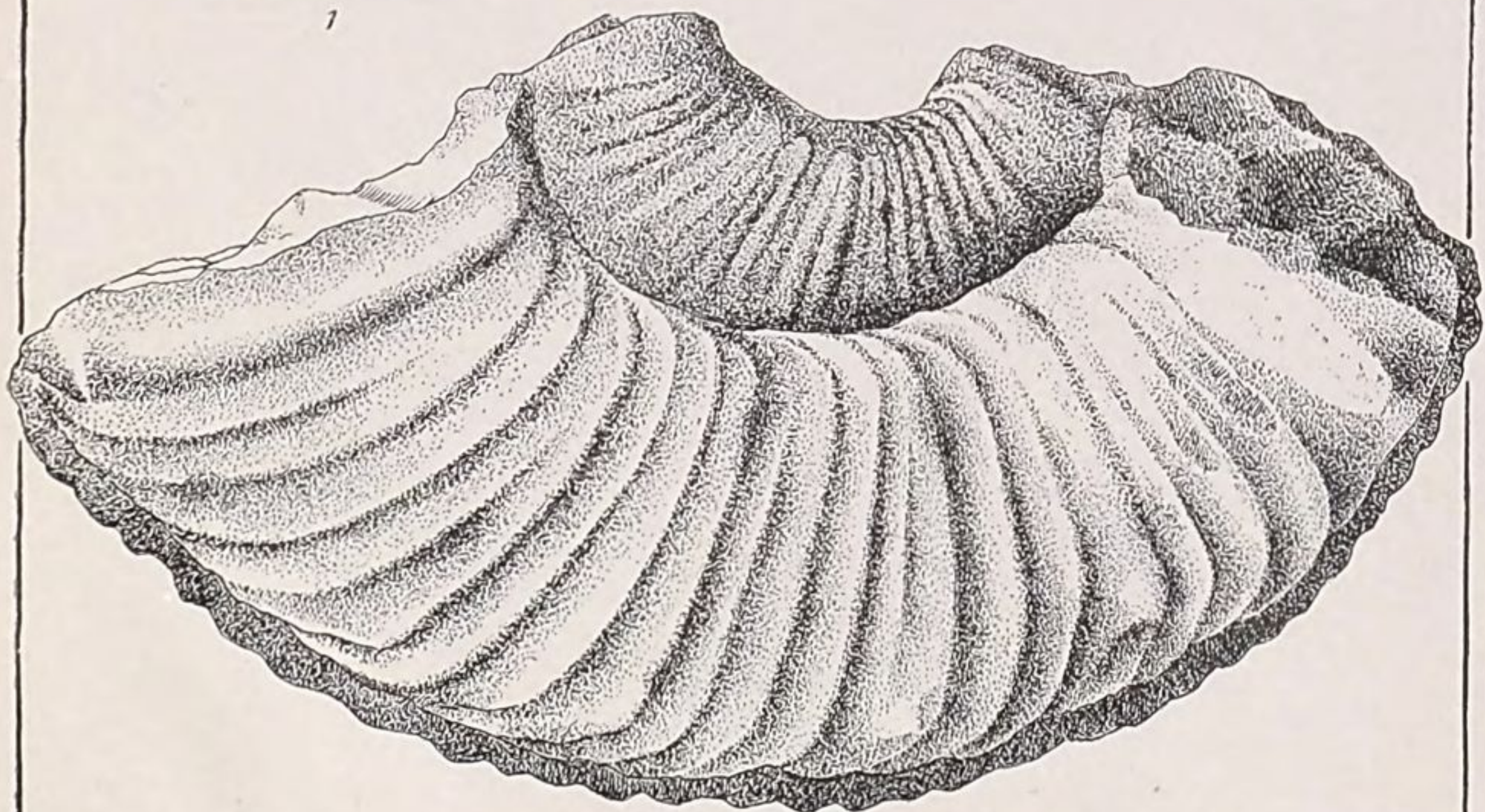
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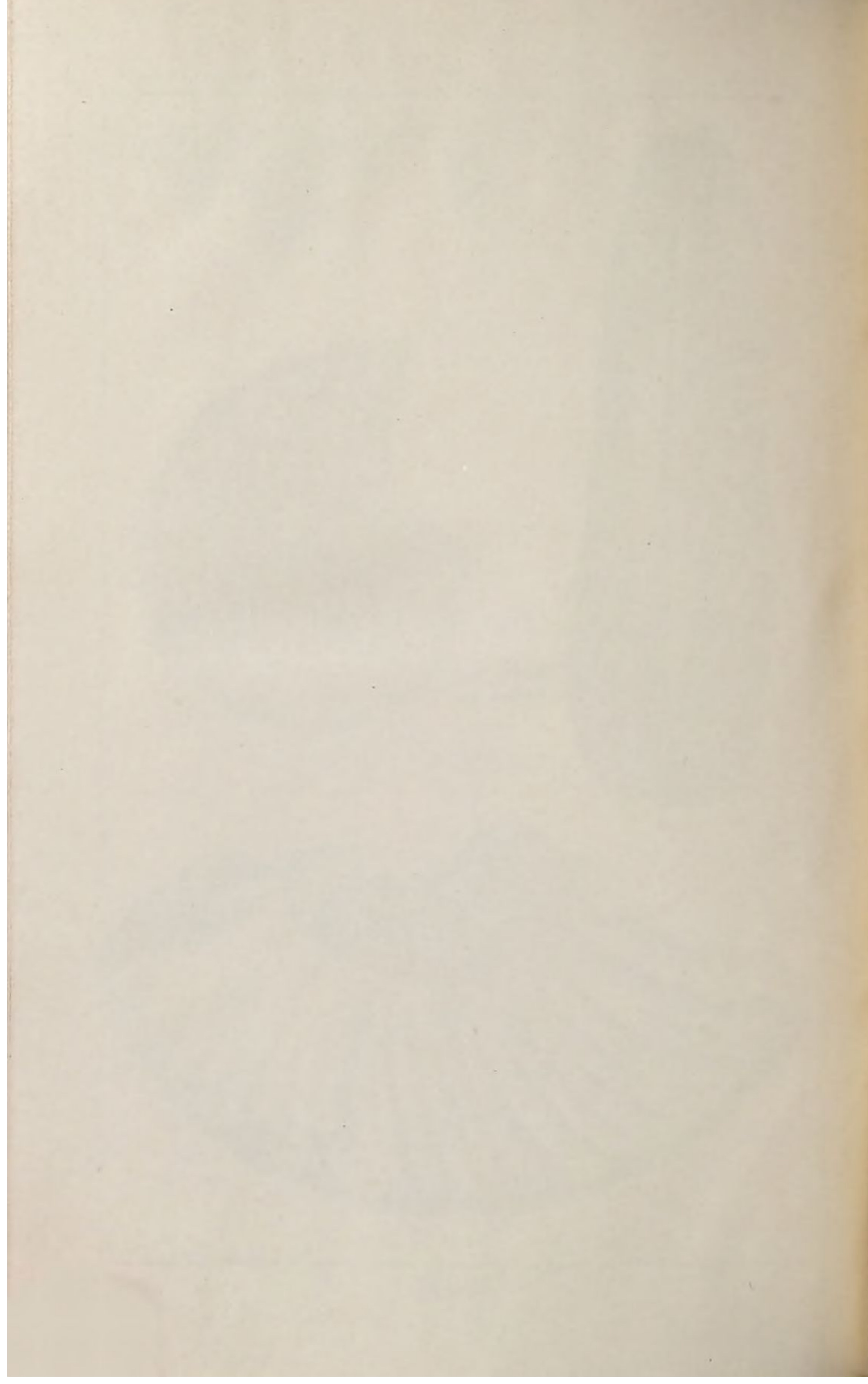
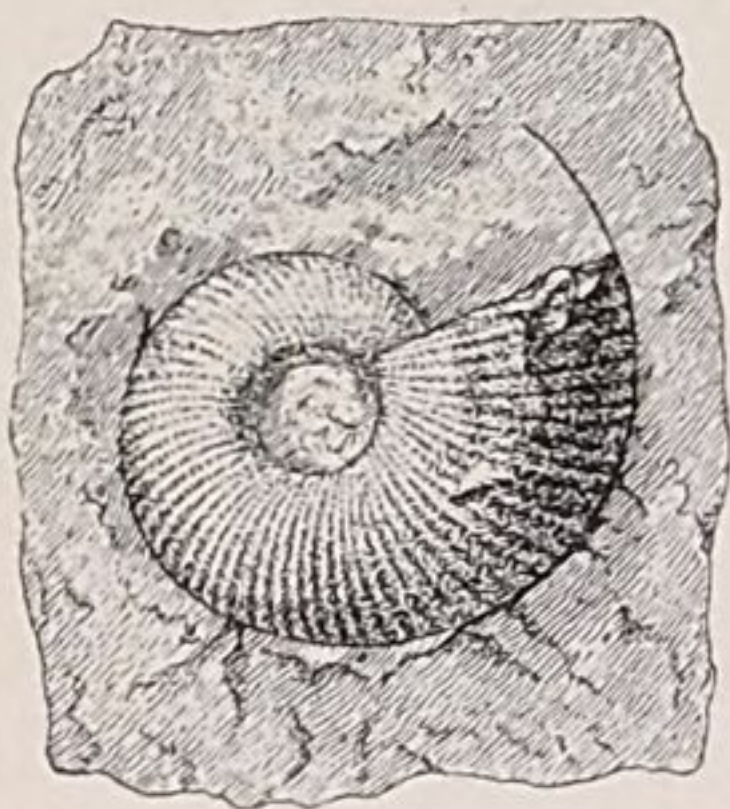


PLATE XLI.

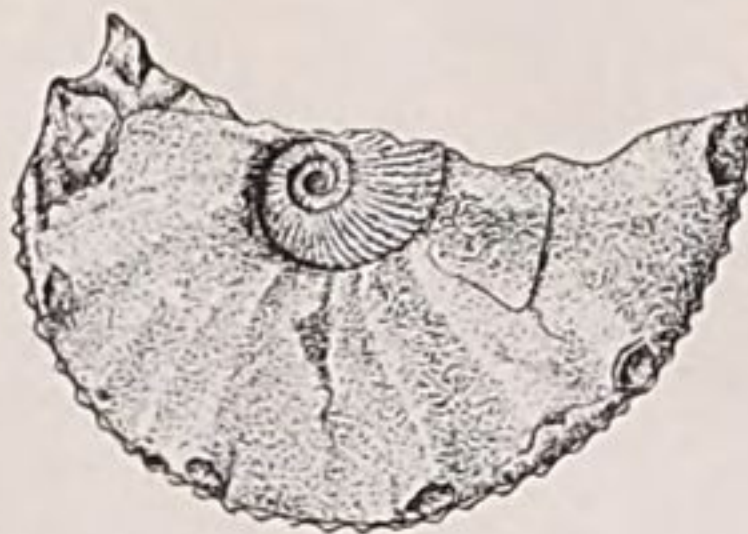
PLATE XLI.

	Page
PRIONOCYCLUS? MACOMBI Meek.....	172
Nat. Mus. Cat. Invert. Foss., 22940.	

- Fig. 1. Side view of a small specimen, enlarged $1\frac{1}{2}$ diameters. The drawing shows too great a convexity.
2. Side view of a larger fragment showing the inner volutions, the serrate keel, and unusually strong nodes near the periphery.
3. Septum of another specimen magnified.
- 4, 5. Two views of the type (after Meek).



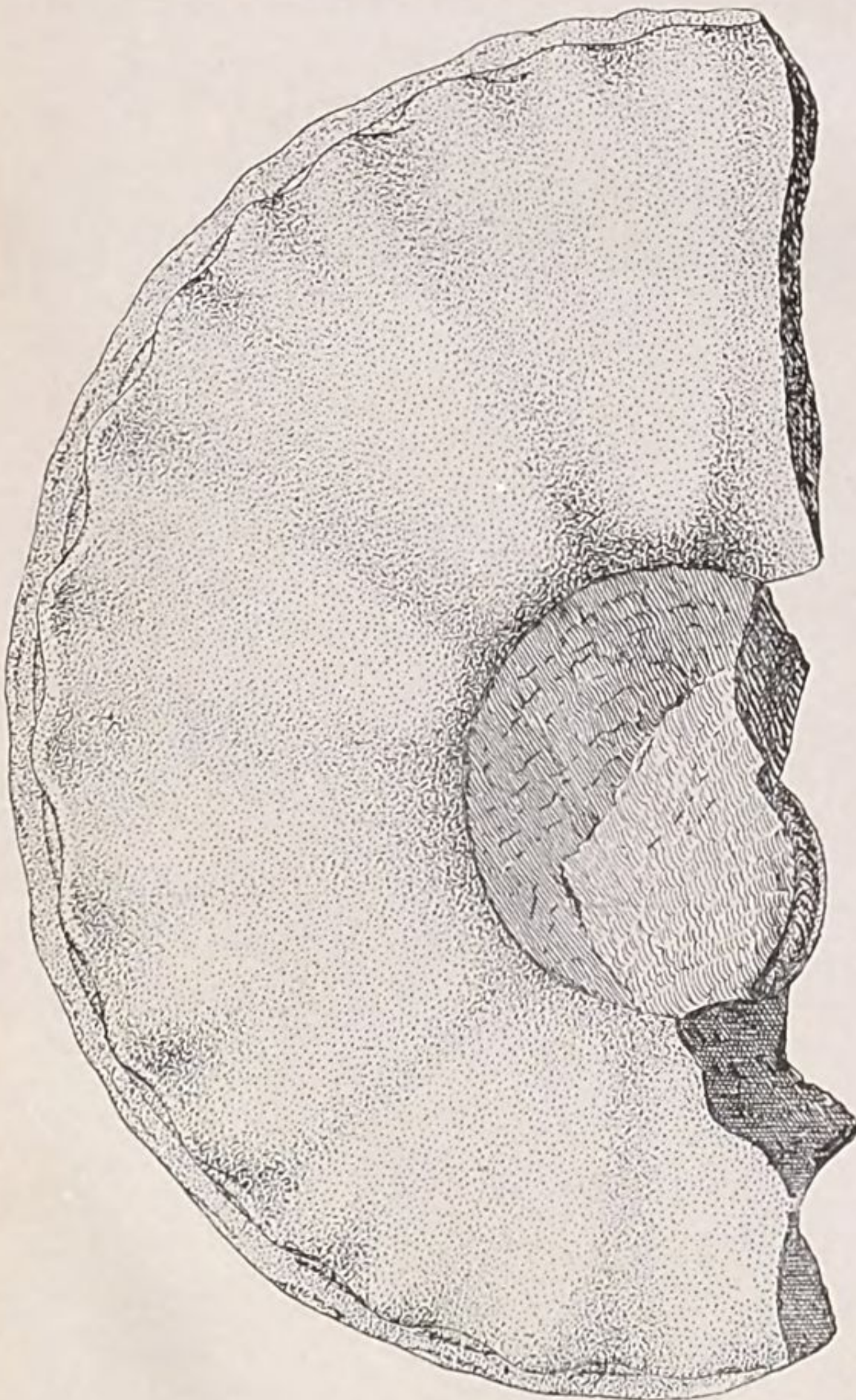
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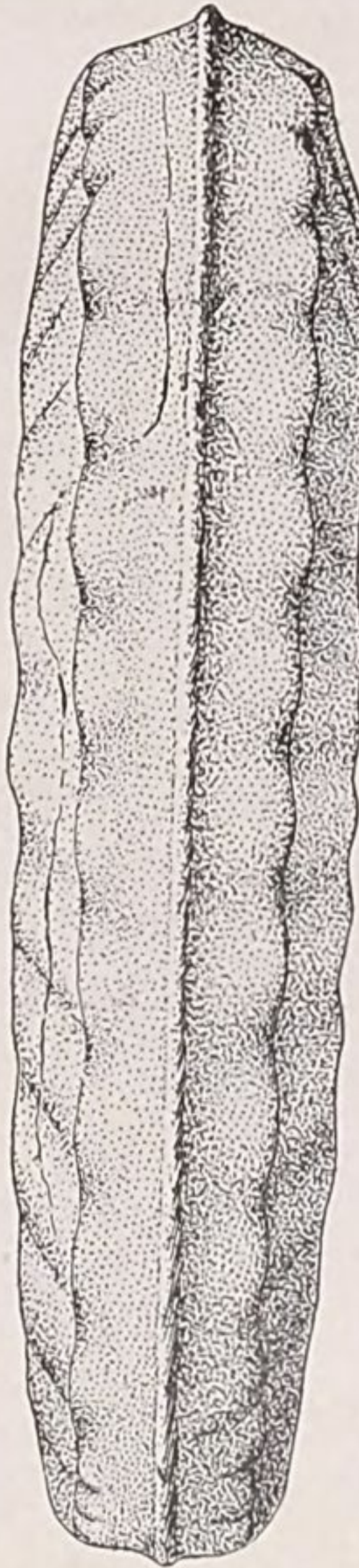
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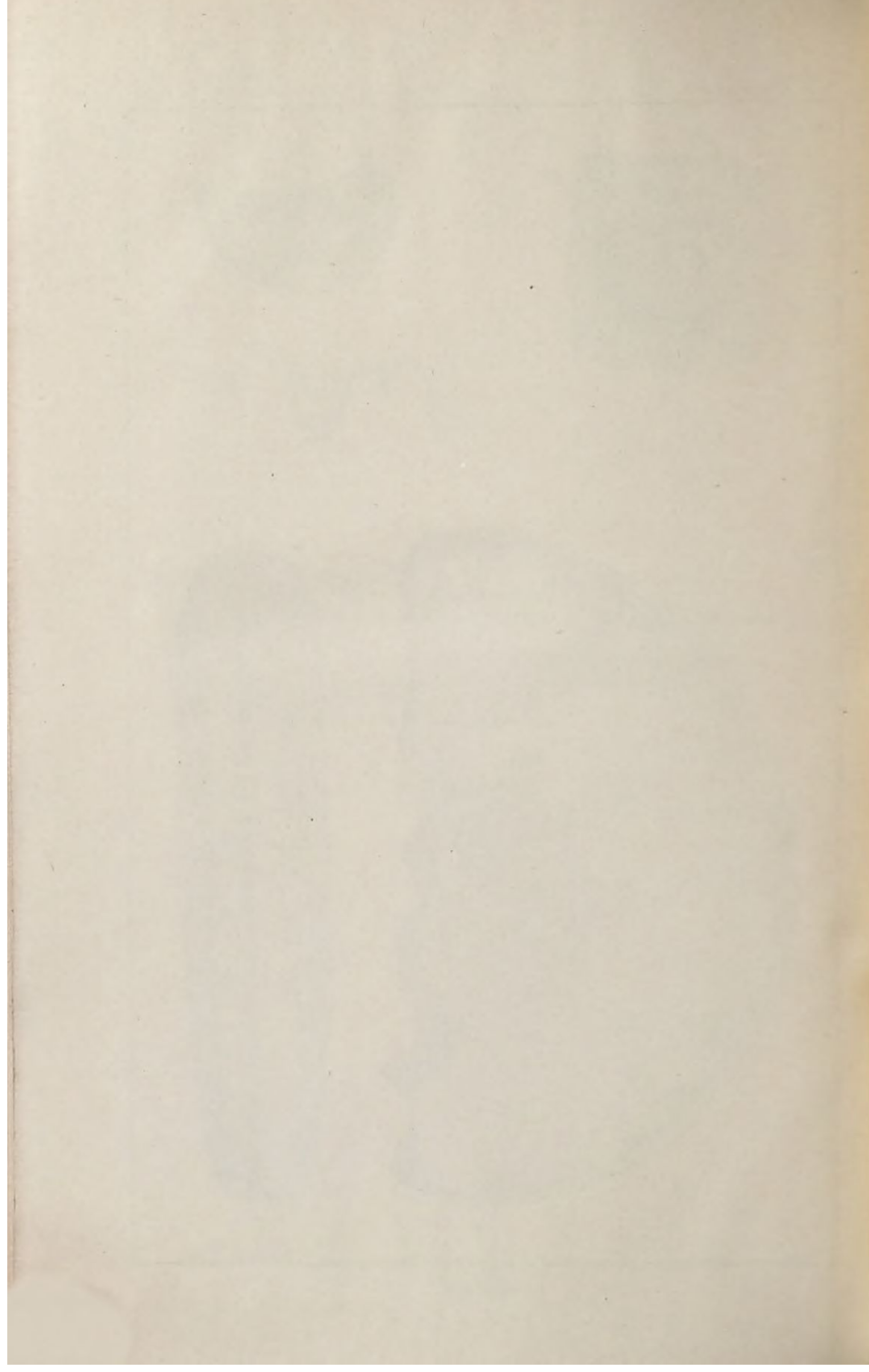


PLATE XLII.

PLATE XLII.

	Page.
PRIONOTROPIS WOOLGARI Mantell.....	174
Fig. 1, 2. Two views of a small specimen (after Meek).	
3. Peripheral view of a fragment of a large individual (after Meek).	
4. Septum of a small specimen, magnified (after Meek).	
PRIONOTROPIS HYATTI n. sp	176
Nat. Mus. Cat. Invert. Foss., 22941.	
Fig. 5, 6. Two views of a specimen of average size.	
7. Side view of a smaller example.	
8. Septum of a small specimen, magnified.	



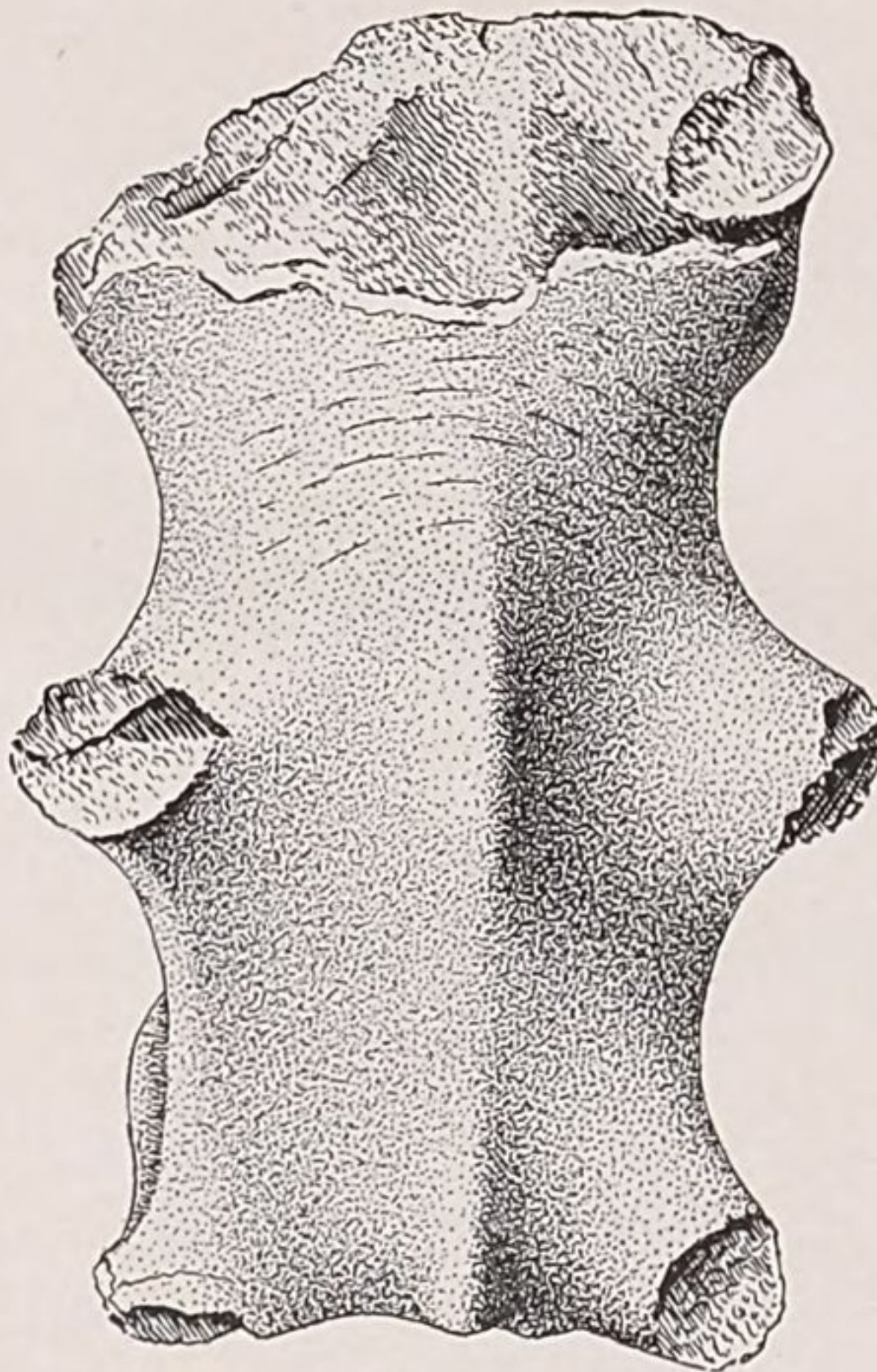
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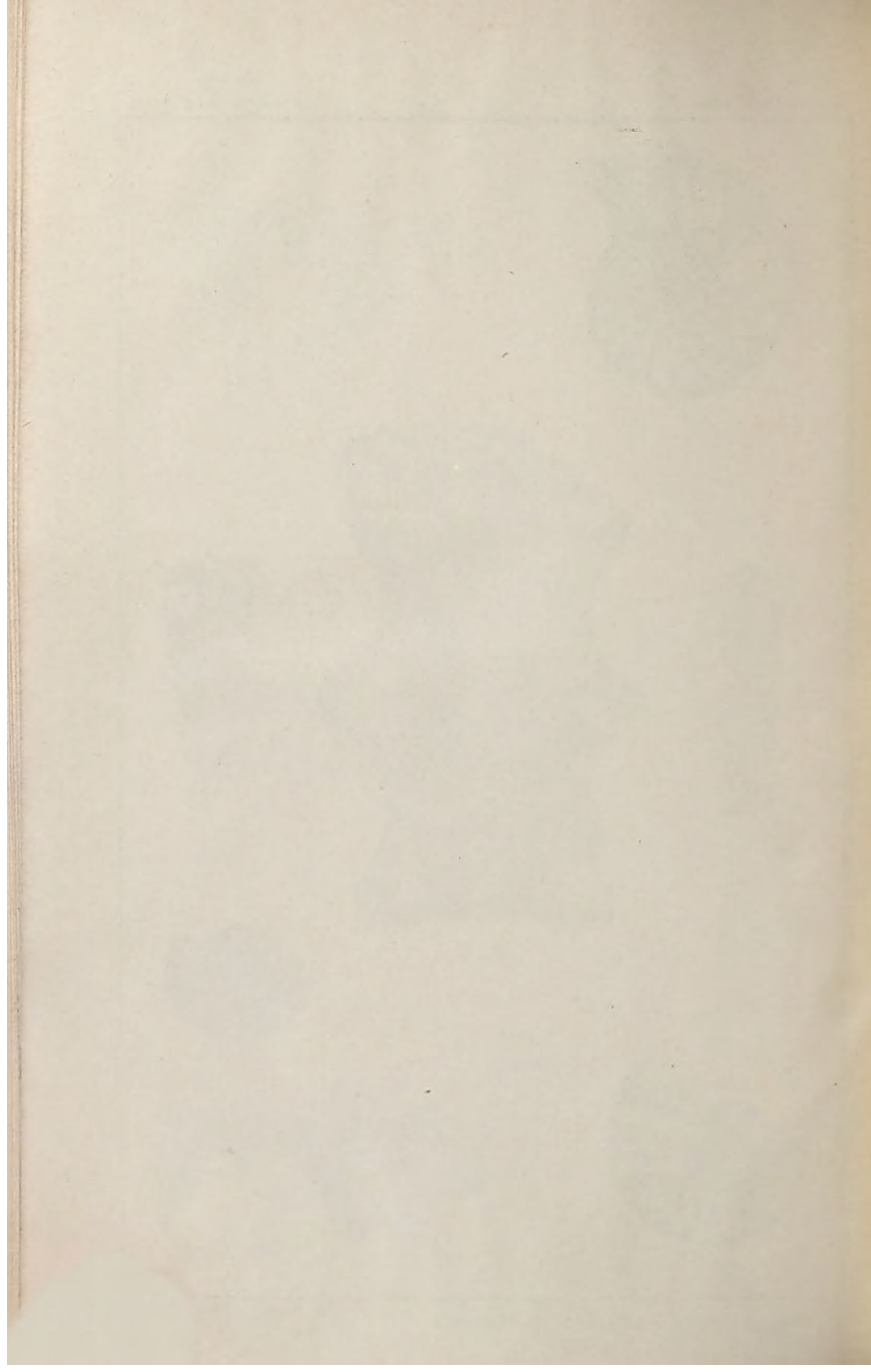
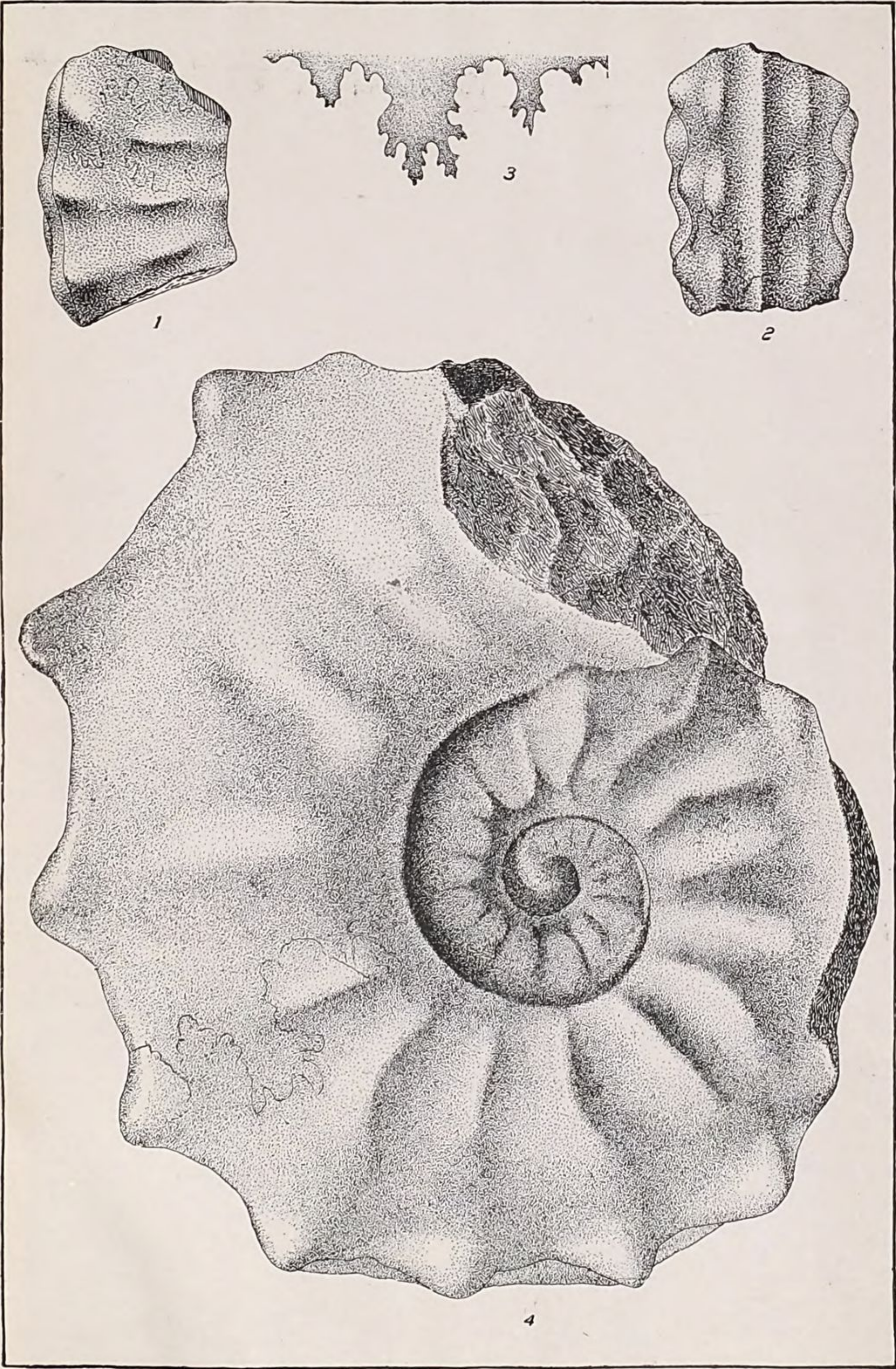


PLATE XLIII.

PLATE XLIII.

	Page.
MORTONICERAS SHOSHONENSE Meek.....	179
Fig. 1, 2. Two views of the type specimen (after Meek).	
PRIONOTROPIS? LÆVIANUS White	178
Nat. Mus. Cat. Invert. Foss., 8629.	
Fig. 3. Portion of the septum of the type.	
4. Side view of the type (after White).	



AMMONOIDEA.

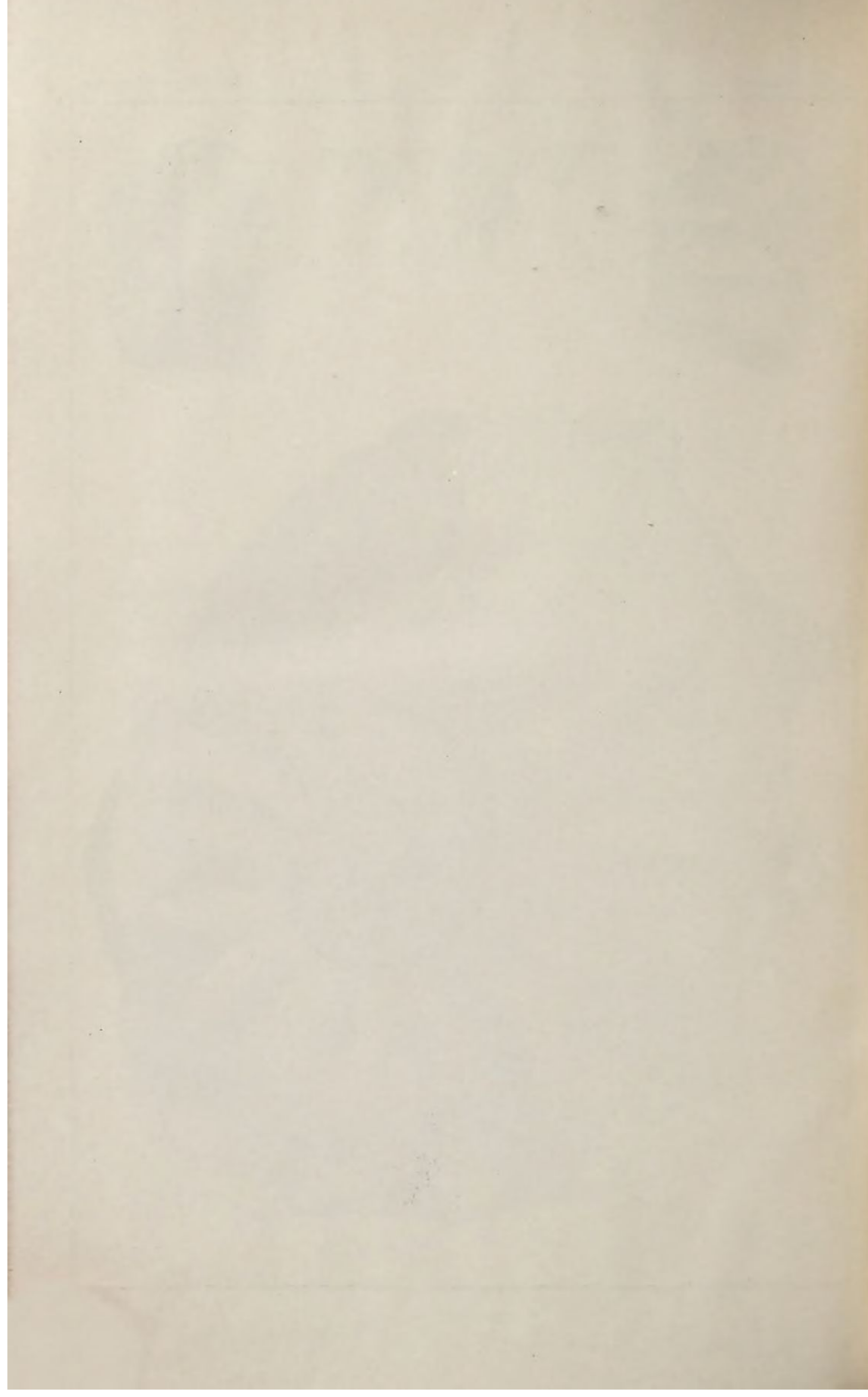
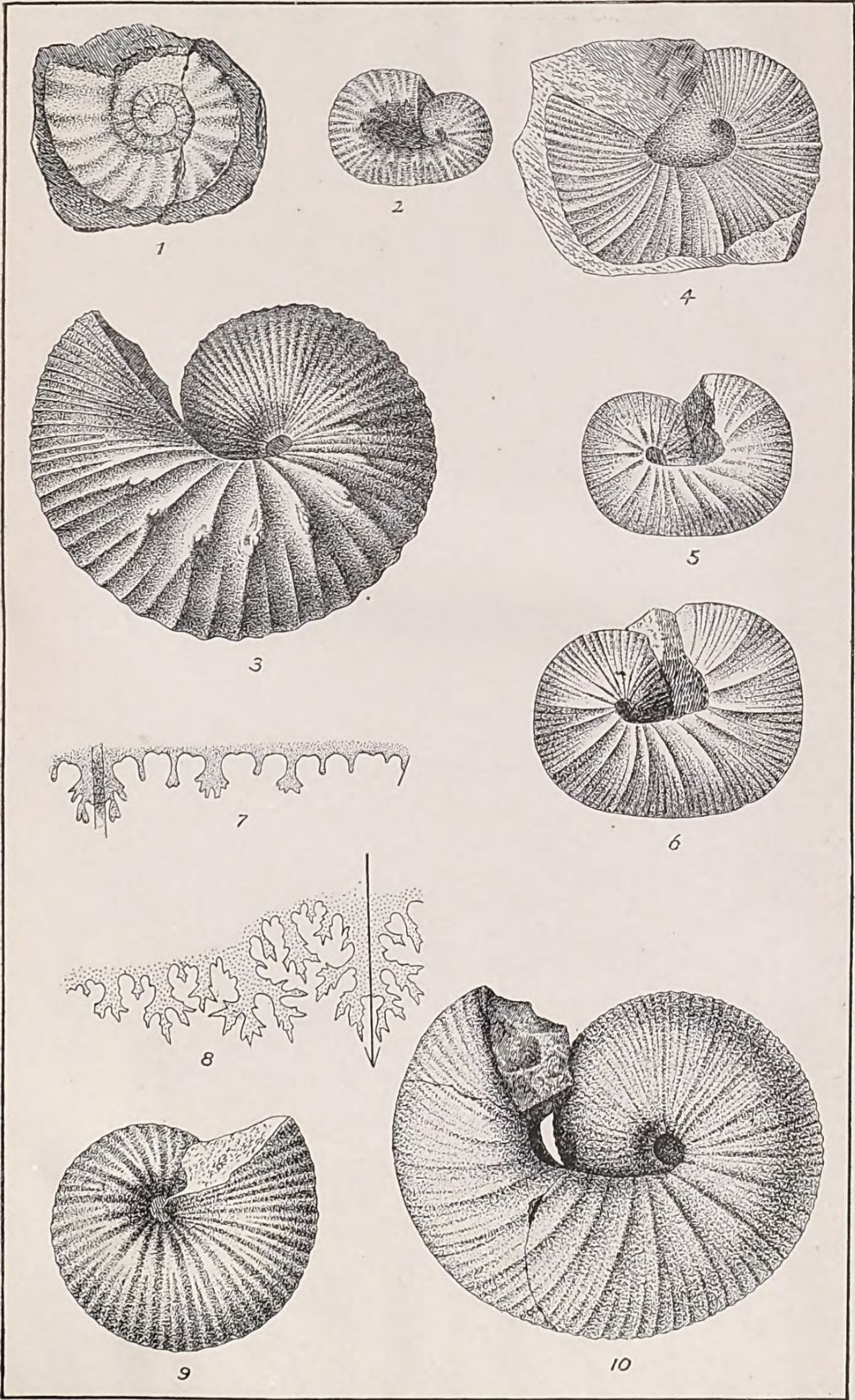


PLATE XLIV.

PLATE XLIV.

	Page.
MORTONICERAS? VERMILIONENSE M. & H.....	180
Fig. 1. Side view of the type (after Meek).	
SCAPHITES LARVÆFORMIS M. & H.....	182
Fig. 2. Side view of the type specimen (after Meek).	
SCAPHITES VERMIFORMIS M. & H.....	183
Fig. 3. Side view of the type (after Meek).	
SCAPHITES WARRENI M. & H.....	185
Fig. 4. Side view of the type (after Meek).	
5. Side view of a specimen referred to <i>Scaphites wyomingensis</i> (after Whitfield).	
6. Side view of another example (after Whitfield).	
7. Septum of a large specimen, enlarged (after Whitfield).	
SCAPHITES VENTRICOSUS M. & H.....	186
Fig. 8. Septum, enlarged (after Meek).	
9. Side view of the inner volutions (after Meek).	
10. Side view of a more perfect specimen from Cinnabar mountain, Montana. (See Pl. XLV).	
Nat. Mus. Cat. Invert. Foss, 18817.	



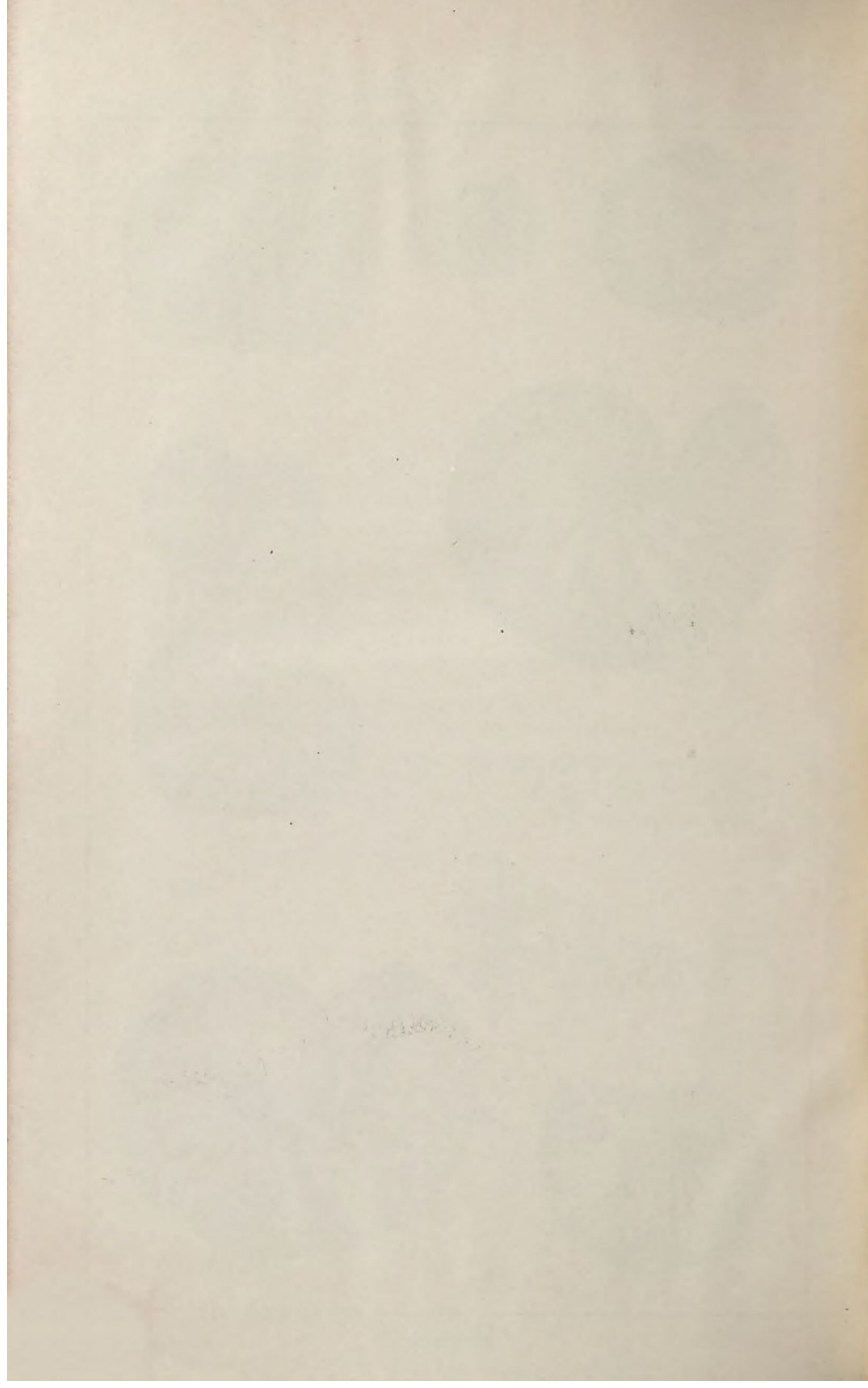
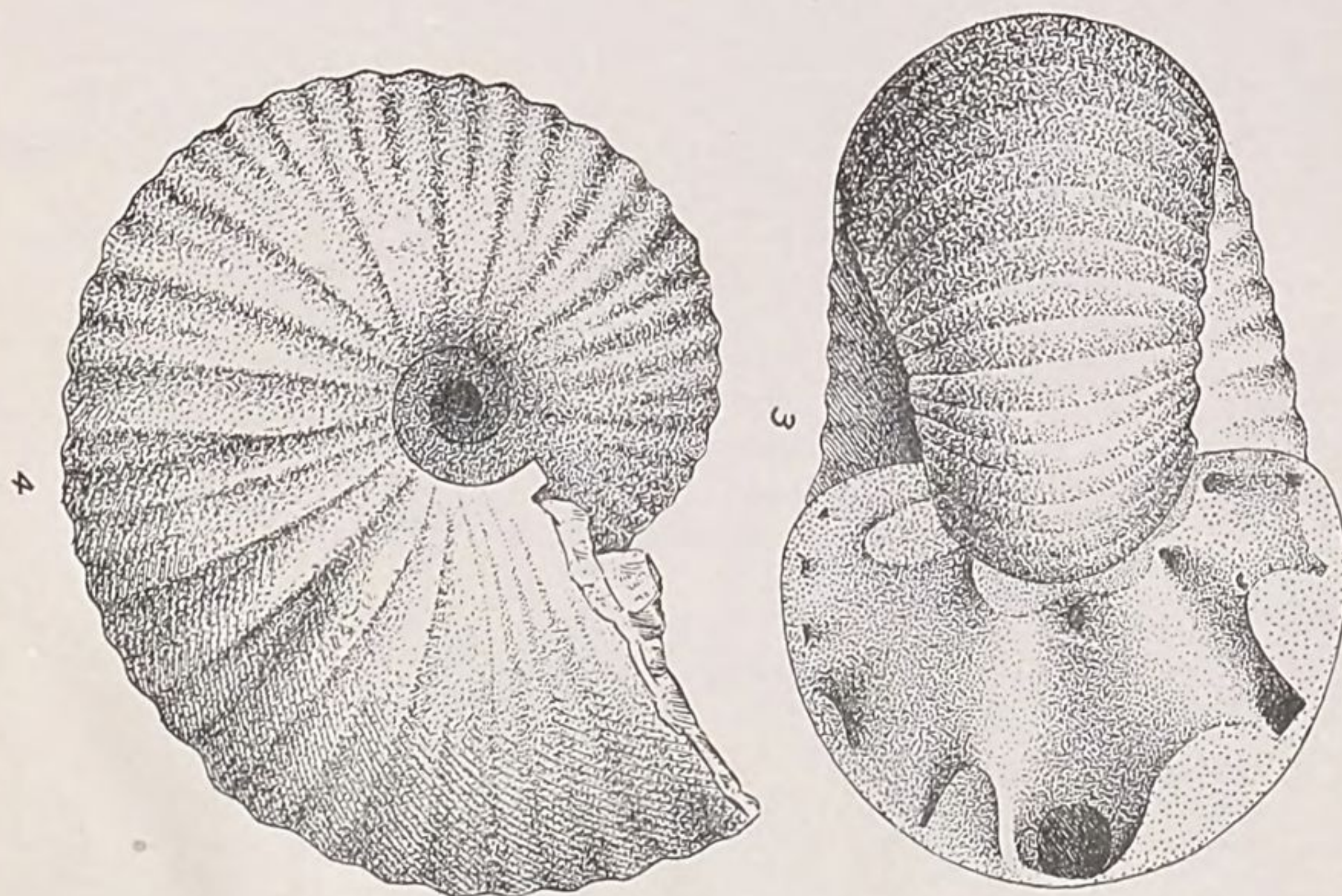
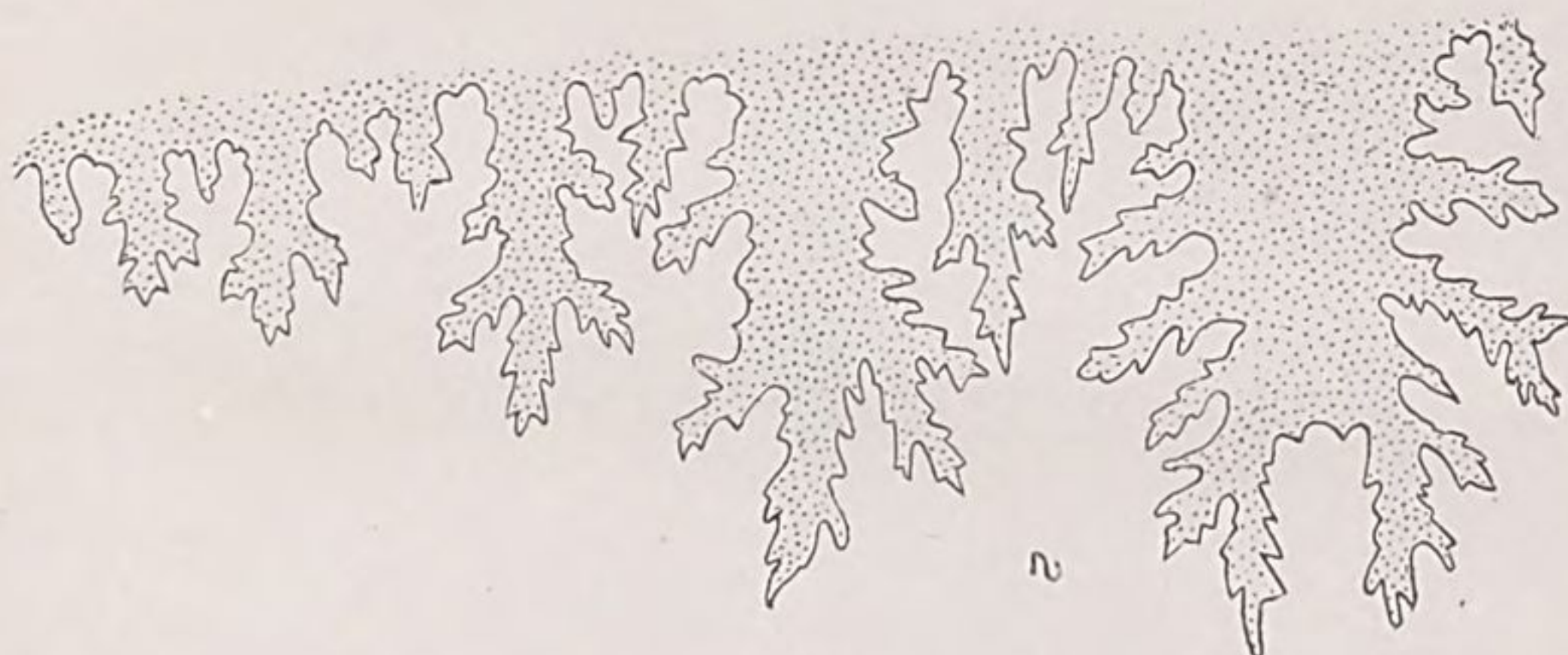
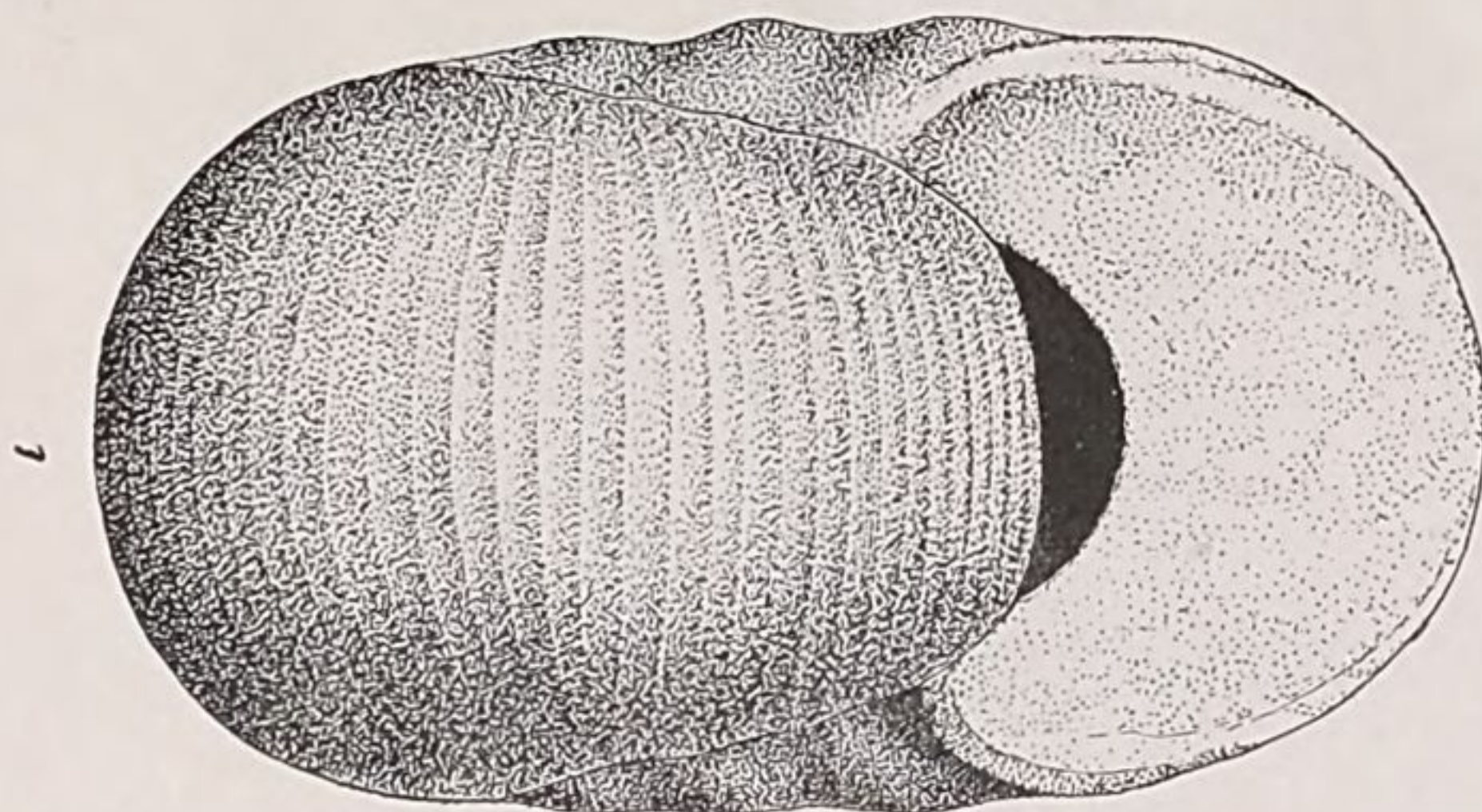


PLATE XLV.

PLATE XLV.

	Page.
SCAPHITES VENTRICOSUS M. & H.....	186
Fig. 1. Peripheral view of large specimen (after Meek). (See Pl. XLIV.)	
SCAPHITES MULLANANUS M. & H.....	187
Fig. 2. Septum, enlarged (after Meek).	
3, 4. Two views of the type (after Meek).	



AMMONOIDEA.

INDEX.

[References to descriptions of species are indicated by figures in full-faced type.]

A.

	Page.
<i>Acanthoceras?</i> <i>kanabense</i>	35, 181
<i>Actaeon</i>	161
<i>propinquus</i>	29, 161
<i>subellipticus</i>	162
<i>Admete</i>	
<i>gregaria</i>	158, 160
<i>rhomboides</i>	158
<i>subfusiformis</i>	159
<i>Admetopsis</i>	158
<i>humerosa</i>	160
<i>rhomboides</i>	36, 39, 158
<i>subfusiformis</i>	39, 159
<i>Ampullina</i> <i>bulbiformis</i>	137
<i>Amauropsis</i>	137
<i>alveata</i>	137
<i>bulbiformis</i>	28, 29, 50, 137
<i>utahensis</i>	39, 138
<i>Ammonites</i>	
<i>bravaisianus</i>	174
<i>carolinus</i>	50, 174
<i>germari</i>	50, 172
<i>graysonensis</i>	48, 176
<i>loevianus</i>	178
<i>meekianus</i>	48, 176
<i>mullananus</i>	187
<i>nodosoides</i>	50, 178
<i>percarinatus</i>	174
<i>placenta</i>	169
<i>serratocarinatus</i>	171
<i>swallovi</i>	168
<i>vermiliose</i>	180
<i>vespertinus</i>	48, 170
<i>woolgari</i>	50, 174
<i>Anatina</i>	117
<i>lineata</i>	28, 29, 40, 47, 117
<i>sulcatina</i>	117
<i>Anchura</i>	145
<i>americana</i>	14, 146
<i>fusiformis</i>	144, 148
<i>newberryi</i>	148
<i>nuptialis</i>	147
<i>prolabiata</i>	35
(<i>Drepanocheilus</i>) <i>prolabiata</i>	35, 144
(<i>Drepanocheilus</i>) <i>ruida</i>	35, 145
<i>Ancyloceras</i> <i>annulatus</i>	48, 164
<i>Anisomyon</i>	14, 26

	Page
<i>Anomia</i>	66
<i>concentrica</i>	67
<i>gryphorhynchus</i>	67
<i>micronema</i>	68
<i>nitida</i>	66
<i>obliqua</i>	49, 68
<i>propatoris</i>	41, 42, 47, 67
<i>subquadrata</i>	29, 50, 66
<i>truncata</i>	50, 67
<i>Aporrhais</i>	143
<i>occidentalis</i>	145
<i>parkinsoni</i>	144, 148
<i>reussi</i>	144
<i>schlotheimi</i>	144, 148
(<i>Perisoptera?</i>) <i>prolabiata</i>	144
(<i>Goniocheila</i>) <i>castorensis</i>	143
<i>Arca?</i> <i>coalvillensis</i>	89
<i>Arkansas</i> valley, Colorado, Cretaceous sec-	
tion in.....	27
list of fossils from.....	28
<i>Avicula</i>	72
<i>caudigera</i>	50, 72
<i>gastrodes</i>	29, 37, 48, 50, 72
<i>linguiformis</i>	73
(<i>Oxytoma</i>) <i>erecta</i>	72
(<i>Pseudoptera</i>) <i>propleura</i>	74
(<i>Pseudoptera</i>) <i>rhytophora</i>	74

B.

<i>Baculites</i>	166
<i>anceps</i>	22, 167
<i>asper</i>	25, 47, 48, 51, 167
<i>baculoides</i>	167
<i>bohemicus</i>	50
<i>gracilis</i>	32, 33, 35, 48, 50, 166
<i>incurvatus</i>	51, 168
<i>ovatus</i>	43, 166
<i>Barbatia</i>	89
<i>coalvillensis</i>	89
<i>micronema</i>	36, 39, 44, 47, 89
<i>Bear River</i> formation, position of.....	15, 45
section of.....	45
<i>Belemnitella</i> <i>manitobensis</i>	49
<i>Black Hills</i> of Dakota, Cretaceous section	
in.....	23

	Page.		Page.
British America, Colorado Cretaceous species from.....	19, 49	Cragin, F. W., on lower Cretaceous in Kan..	22
Buchiceras.....	163	Crassatella.....	96
swallovi.....	35, 48, 168	cimarronensis.....	96
syriacum.....	169	excavata.....	96
C.		Cretaceous sections in—	
Callista.....	108	Black hills.....	23
deweyi.....	108	Colorado.....	26-31, 33
owenana.....	108	Iowa.....	21
(Aphrodina?) tenuis.....	109	Kansas.....	22
(Dosiniopsis) orbiculata.....	108	Minnesota.....	22
Camptonectes.....	72	Montana.....	24
bellistriata.....	72	Nebraska.....	14
platessa.....	35, 72	New Mexico.....	30, 31
Cancellaria malachitensis.....	29, 158	Utah.....	34-46
Canyon city, Colo.....	27	Wyoming.....	35
Cardium.....	99	Crinoidea.....	52
curtum.....	43	Crustacean remains in the Colorado formation.....	189
pauperculum.....	28, 29, 34, 36, 39, 40, 45, 48, 99	Cucullæa (Trigonarca?) obliqua.....	92
subcurtum.....	99	Cyprimeria subalata.....	113
trite.....	100	Cyrena.....	101
Cassidulus stantoni.....	29, 52	aequilateralis.....	102
Cassiope whitfieldi.....	132	carletoni.....	41
Cedar city, Utah, Cretaceous section.....	36	erecta.....	101
Cenomanian.....	50, 52	inflexa.....	103
Cephalopoda.....	163	securis.....	101
Cerithium lallierianum.....	140	Cytherea.....	
Chemnitzia? coalvillensis.....	39, 141	orbiculata.....	108
Coal in the Colorado formation.....	34, 35, 38, 45	tenuis.....	109
Coalville, Utah, Cretaceous section.....	37-44	D.	
Colorado, Cretaceous sections in.....		Dakota, Cretaceous in Black hills.....	23
on Arkansas river.....	27, 28	Dakota formation, fossils of.....	21
at Colorado Springs.....	27	Dall, W. H., acknowledgments to.....	12
near Denver.....	26	Dawson, G. M., cited.....	49
on Gunnison river.....	33	Denver, Colorado, Cretaceous sections near.....	26
in Huerfano park.....	29	Dione orbiculata.....	108
near Mancos.....	32	tenuis.....	119
local lists of Cretaceous fossils from.....	26, 28, 29	Donax.....	110
Colorado formation.....		cuneata.....	43, 45, 110
correlated with the Austin limestone and Eagle Ford shales.....	48	lata.....	110
with the Turonian and Emscher.....	51	oblonga.....	40, 111
definition of.....	18	Dutton, C. E., cited.....	34
fauna of, compared with other Cretaceous faunas.....	47	E.	
geologic description of.....	20	Echinodermata.....	52
geographic distribution of.....	19	Eldridge, Geo. H., Cretaceous section in central Colorado.....	26
history of.....	13	nomenclature and classification of Upper Cretaceous formations.....	18
sections of.....	14, 21-46	Emmons, S. F., cited.....	16, 38
Colorado Springs, Colorado.....	27	Emscher Mergel.....	50
Cope, E. D., correlation of Niobrara limestone, with the Turonian.....	51	Engelmann, Henry, cited.....	37
Corbicula.....		Eulima? funicula.....	140
aequilateralis.....	102	Eulimella.....	
crassatelliformis.....	123	chrysallis.....	41, 42
(Veloritina) durkeel.....	101	funicula.....	36, 39, 140
Corbula.....	123	inconspicua.....	41
nematophora.....	34, 35, 36, 39, 40, 124	Euspira coalvillensis.....	138
kanabensis.....	35, 125	utahensis.....	138
perangulata.....	123	Exogyra:	
perundata.....	123	columbella.....	48, 63
traski.....	125	costata.....	63, 65
tropidophora.....	123		
subtrigonalis.....	41, 42, 45, 47, 123, 125		

	Page.		Page.
Exogyra—Continued:		Helicoceras	164
<i>fimbriata</i>	65	<i>annulatum</i>	164
<i>laeviuscula</i>	48, 64	<i>corrugatum</i>	165
<i>ponderosa</i>	64, 65	<i>mortoni</i>	165
<i>suborbiculata</i>	28, 29, 50, 62	<i>pariense</i>	35, 164
F.		Hill, R. T., faunal lists of the Texan Cretaceous	48
Fasciolaria	153	Hills, R. C., cited on the Laramie of western Colorado	31
(<i>Cryptorhytis</i>) <i>flexicostata</i>	154	<i>on the Huerfano park Tertiary beds</i>	29
(<i>Cryptorhytis</i>) <i>utahensis</i>	29, 40, 153	Hippurites	97
(<i>Mesorhytis</i>) <i>gracilentata</i>	153	Holmes, W. H., cited on Cretaceous of southwestern Colorado	31
<i>walcotti</i>	153	Howell, E. E., cited	34
Fauna of the Colorado formation		Huerfano park, Colorado, Cretaceous section in	29, 30
characteristic species of	48	<i>Tertiary beds</i>	29
compared with other Cretaceous faunas	47	Hyatt, Alpheus, acknowledgments to	12
description of species of	52	<i>on the genera Prionotropis and Prionocyclus</i>	171, 176
local lists of species of	22-40	I.	
Fauna of the Montana formation		Idonearca depressa	93
characteristic species of	48	Inoceramus	76
compared with fauna of the Colorado formation	47	<i>altus</i>	23
Fort Benton group	14, 16, 24	<i>aviculoides</i>	77
correlated with the Eagle Ford shales ..	19, 48	<i>copulus</i>	81
Fort Pierre group	14	<i>confertim-annulatus</i>	77
Fossil plants, list of, from the Montana formation at Coalville, Utah	42	<i>conradi</i>	86
Fox Hills group	14, 18	<i>cuvieri</i>	50, 51
Fusus	150	<i>deformis</i>	22, 26, 28, 48, 50, 51, 85
<i>dakotensis</i>	152	<i>dimidiatus</i>	32, 33, 48, 78
<i>gabbi</i>	39, 151	<i>exogyroides</i>	24, 48, 49, 81, 83
<i>shumardi</i>	23, 150	<i>flaccidus</i>	80
(<i>Neptunea</i> ?) <i>utahensis</i>	153	<i>fragilis</i>	23, 24, 28, 29, 31, 32, 35, 48, 76
(<i>Neptunea</i> ?) <i>venenatus</i>	29, 152	<i>gilberti</i>	79
G.		<i>howelli</i>	76
Gastropoda	127	<i>involutus</i>	48, 51, 81
Gervillia	74	<i>labiatus</i>	21, 22, 23, 26, 28, 29, 31, 32, 33, 35
<i>gregaria</i>	74	37, 38, 39, 40, 45, 48, 49, 50, 51, 77	
<i>propleura</i>	29, 40, 48, 74	<i>mytiloides</i>	77
Gilbert, G. K., cited	33, 34	<i>mytilopsis</i>	77
Glauconia coalvillensis	34, 39, 48, 132	<i>perplexus</i>	23, 76
Greensand	50	<i>problematicus</i>	77
Gryphæa	60	<i>pseudomytiloides</i>	77
<i>columba</i>	62	<i>simpsoni</i>	79
<i>newberryi</i>	31, 32, 35, 48, 60	<i>tenuirostratus</i>	24, 81, 83
<i>pitcheri</i>	31, 60, 62	<i>tenuirostris</i>	83
Gyrodes	135	<i>umbonatus</i>	24, 48, 51, 81
<i>conradi</i>	29, 136	<i>undabundus</i>	24, 48, 49, 81, 84
<i>crenata</i>	136	Iowa, Cretaceous in	21
<i>depressa</i>	29, 39, 40, 135	Iron city, Utah, list of fossils from	37
<i>pansus</i>	136	K.	
<i>petrosa</i>	136	Kanab valley, Utah, Cretaceous section	34
H.		Kanarra, Utah, Cretaceous section	36
Hague, A., cited	16	Kansas, Cretaceous section of	22
Hall and Meek, cited	13	<i>Lower Cretaceous in</i>	22
Haminea truncata	29, 162	King, Clarence, Colorado formation named by	16
Haploscapa	85	Kloos, J. H., on Cretaceous in Sauk valley, Minn	20
<i>capax</i>	85	Knowlton, F. H., list of fossil plants from Coalville, Utah	42
<i>eccentrica</i>	85		
<i>grandis</i>	85		
Hayden, F. V., cited	37		

L.		N.	
	Page.		Page.
Lakes, A., cited	31	Natica	
Legumen, sp	29, 107	bulbiformis	137
Lesquereux, Leo, cited	37	Concinna	134
Lima	71	moreauensis	134
utahensis	35, 71	obliquata	134
wacoensis	71	rectilabrum	134
Lingula subspatulata	49	Naticina obliqua	139
Liopistha	118	Nautilus	163
frequens	120	elegans	24, 48, 50, 51, 163
(Psilomya) concentrica	28, 29, 48, 119	texanus	163
(Psilomya) elongata	35, 119	Nebraska, Cretaceous in	14, 21
(Psilomya) meeki	35, 48, 118	Nemodon sulcatus	35, 91
Lispodesthes	146	Neritina	127
lingulifera	147	bannisteri	41
nuptialis	147	bellatula	41
obscurata	148	carditoides	41, 128
Loricula canadensis	49	incompta	128
Lucina	97	pisiformis	127
juvenis	29, 98	pisum	39, 127
subundata	35, 47, 97	(Velatella) patelliformis	39, 128
Lunatia	134	Newberry, Dr. J. S., cited on Cretaceous in	
concinna	35, 47, 134	New Mexico	30, 31
obliquata	134	New Mexico, Cretaceous in	30
utahensis	135	Newton, Henry, Cretaceous in the Black	
M.		Hills of Dakota	23
Mactra	120	Niobrara group	15
emmonsi	29, 39, 40, 121	correlated with Austin limestone	19, 48
huerfanensis	29, 122	correlated with the Turonian by E. D.	
warrenana	122	Cope	51
(Cymbophora?) utahensis	39, 44, 120	Nishnabotany sandstone	21
Mancos, Colo., Cretaceous section	32	Nucula	94
Marcou, Jules, cited	30	cancellata	94
Meek, F. B., cited	13, 17, 37	coloradoensis	94
Meek and Hayden, Cretaceous section by ..	14	planimarginata	94
correlation of American and European		O.	
Cretaceous formations	50	Ostrea	54
Melampus	162	anomioides	25, 55
antiquus	41	belliplicata	48, 58
Melania	42	blackii	58
Meretrix orbiculata	108	coalvillensis	41
tenuis	109	congesta	22, 23, 26, 31, 32, 49, 55
Mesostoma occidentalis	29, 139	cortex	56
Minnesota, Cretaceous in	20	ferdinandi	64
Modiola	86	lugubris	28, 29, 32, 48, 58
ornata	88	malachitensis	28, 29, 57
pedernalis	87	malleiformis	58
tenuisculpta	49	patina	54
(Brachydontes) multilinigera	34, 39, 41, 44, 86	prudentia	47, 54
Montana, Cretaceous in	24	ratisbonensis	62
section of Cretaceous in Cinnabar coal		soleniscus	34, 36, 39, 45, 47, 56
field	24	uniformis	59
list of Cretaceous fossils from	24, 25	P.	
Montana formation	18	Pacific coast, Cretaceous formations of	49
characteristic species of	48	Parapholas	125, 127
fauna of, compared with Colorado		californica	126
fauna	47	sphenoides	39, 125
Mortoniceras	179	Peale, A. C., Cretaceous section in western	
shoshonense	48, 51, 179	Colorado, by	31, 33
vermillionense	180	Pelecypoda	54
vespertinum	48, 51	Pharella?	115
Mudge, B. F., Cretaceous in Kansas	22	dakotensis	114
		pealei	115

	Page.
<i>Pholadomya</i>	116
<i>breweri</i>	117
<i>coloradoensis</i>	29, 116
<i>papyracea</i>	24, 49, 116
<i>subventricosa</i>	39, 43, 117
<i>tenera</i>	116
<i>Physa</i>	163
<i>carletoni</i>	41
<i>Pinna</i>	88
<i>petrina</i>	29, 88
<i>stevensoni</i>	88
<i>Placenticeras</i>	169
<i>liardense</i>	168, 169
<i>placenta?</i>	29, 43, 169
<i>Placunopsis</i>	68
<i>hilliardensis</i>	68
<i>jurensis</i>	69
Plants, fossil, from Coalville, Utah.....	42
<i>Pleurotoma?</i> <i>hitzi</i>	161
<i>Plicatula</i>	69
<i>arenaria</i>	70
<i>hydrotheca</i>	69
<i>incongrua</i>	70
<i>Poromya globulosa</i>	118
<i>Prionocyclus</i>	170
<i>macombi</i>	32, 172
<i>woolgari</i>	174
<i>wyomingensis</i>	23, 28, 33, 50, 51, 171
<i>Prionotropis</i>	174
<i>carolinus</i>	50
<i>hyatti</i>	28, 29, 40, 176
<i>loevianus</i>	50
<i>woolgari</i>	22, 23, 26, 31, 48, 50, 51, 174
<i>Pteria</i>	
<i>salinensis</i>	73
(<i>Oxytoma</i>) <i>erecta</i>	72
(<i>Oxytoma?</i>) <i>gastrodes</i>	72
(<i>Pseudoptera</i>) <i>propleura</i>	74
(<i>Pseudoptera</i>) <i>rhytophora</i>	74
Pueblo, Colo.....	28
<i>Pugnellus</i>	148
<i>fusiformis</i>	28, 29, 40, 45, 48, 148
<i>manubriatus</i>	149
<i>Pugnellus</i> sandstone, distribution of.....	28
list of fossils from.....	29
<i>Pyropsis</i>	154
<i>bairdi</i>	155
<i>coloradoensis</i>	29, 154
R.	
<i>Radiolites</i> , sp.....	22, 96
<i>austinensis</i>	97
<i>Rapa cancellata</i>	155
<i>Rostellaria rostrata</i>	144
<i>Rostellites</i>	155
<i>ambigua</i>	29, 156
<i>dalli</i>	28, 29, 50, 156
<i>elongata</i>	50
<i>gracilis</i>	29, 155, 157
<i>texana</i>	155
Roubideau creek, Colo., Cretaceous section at mouth of.....	32
S.	
<i>Scalaria matthewsonii</i>	142
<i>Scaphites</i>	182

	Page.
Scaphites—Continued:	
<i>æqualis</i>	50, 185
<i>hippocrepis</i>	184
<i>hugardianus</i>	183
<i>larvæformis</i>	23, 182
<i>mullananus</i>	24, 187
<i>nodosus</i>	186
<i>subglobosus</i>	187
<i>texanus</i>	185
<i>ventricosus</i>	24, 25, 186
<i>vermiculus</i>	183
<i>vermiformis</i>	24, 49, 183
<i>warreni</i>	23, 33, 48, 49, 50, 185
<i>wyomingensis</i>	23, 185
Schlüter, C., correlation of Austin lime- stone with the Emscher Mergel, by... ..	50
<i>Serpula</i>	53
<i>gordialis</i>	53
<i>intrica</i>	35, 53
<i>semicoalita</i>	49
<i>tenuicarinata</i>	53
<i>Sigaretus</i> (<i>Eunaticina</i>) <i>textilis</i>	35, 139
<i>Siliqua huerfanensis</i>	29, 39, 114
Simpson, Chas. T., acknowledgments to....	12
<i>Solemya?</i> <i>obscura</i>	29, 95
<i>Solen guerangeri</i>	115
Stevenson, J. J., cited on Cretaceous in New Mexico.....	30
St. John, O. H., section of Cretaceous in western Iowa by.....	21
T.	
<i>Tapes cyprimeriformis</i>	29, 40, 106
<i>Tellina</i>	111
<i>ashburneri</i>	112
<i>isonema</i>	40, 113
<i>modesta</i>	111
<i>nitidula</i>	121
<i>subalata</i>	40, 113
(<i>Palæomæra</i>) <i>inconspicua</i>	112
(<i>Palæomæra</i>) <i>whitei</i>	29, 112
Texas, Upper Cretaceous formations of....	19, 48
<i>Trachytriton vinculum</i>	151
<i>Trapezium micronema</i>	89
<i>Trigonia</i> sp.....	25, 95
<i>evansana</i>	95
<i>Trigonarca</i>	92
<i>depressa</i>	93
<i>obliqua</i>	29, 39, 92
<i>triquetra</i>	92
<i>Tritonidea huerfanensis</i>	29, 152
<i>Tritonium kanabense</i>	35, 150
<i>Turbonilla</i>	
<i>spillmani</i>	142
(<i>Chemnitzia?</i>) <i>coallvillensis</i>	39, 141
(<i>Chemnitzia</i>) <i>melanopsis</i>	142
Turonian fauna compared with fauna of Colorado formation.....	50
<i>Turris</i> (<i>Surcula?</i>) <i>hitzi</i>	161
<i>Turritella</i>	130
<i>coallvillensis</i>	39, 132
<i>martinezensis</i>	133
<i>micronema</i>	39, 40, 134
<i>spironema</i>	41

	Page.		Page.
Turritella—Continued:		Voluta elongata.....	156
uvasana	130	Volutilithes navarroensis.....	155
whitei.....	28, 29, 35, 48, 130	Volutoderma.....	155
U.		Volutomorpha	158
Uintacrinus socialis.....	22, 52	W.	
Union sp	95	Walcott, C. D., Cretaceous section in Kanab	
Upper Missonri region, Meek and Hayden's		valley, Utah	34
Cretaceous section in	14	Weed, W. H. Cretaceous section in the Cin-	
Utah, Cretaceous sections in.....		nabar coal field, Montana.....	24
at Cedar city and Kanarra	36	White, C. A., cited.....	16, 18, 31, 38
Coalville	38	acknowledgments to	11
Rockport	44	section of Cretaceous in Iowa.....	21
Upper Kanab.....	34	Whiteaves, J. F., cited.....	19, 49
Colorado formation in Castle valley.....	33	Winchell, N. H., on Cretaceous in Minne-	
local lists of Cretaceous fossils from.....	35, 39-44	sota.....	20
V.		Woodbury sandstone	21
Valvata nana	41	Wyoming, Cretaceous in	37, 45
Veniella.....	104	section near mouth of Sulphur creek ...	45
goniophora.....	35, 105	X.	
humilis	23, 105	Xenophora simpsoni.....	28, 29, 133
mortoni	28, 47, 104	Y.	
Venus faba	107	Yoldia subelliptica	29, 94
Vermes	53		
Vertebrate fauna of the Colorado formation.	51		
Volsella multilinigera.....	86		

House documents

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